

APR 14 1919

# MUNICIPAL JOURNAL AND PUBLIC WORKS.

CITY

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VOLUME XLVI  
No. 15

New York, April 12, 1919

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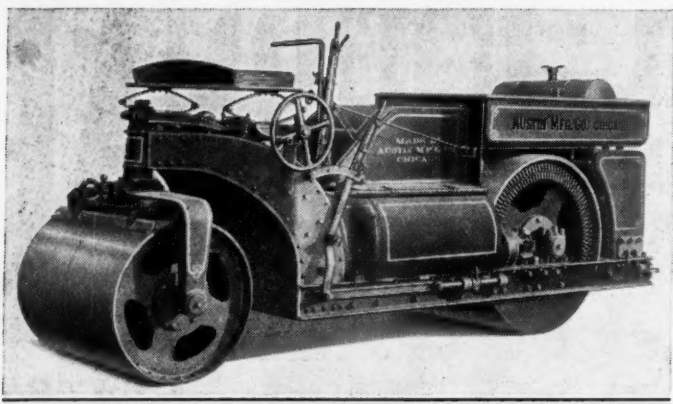
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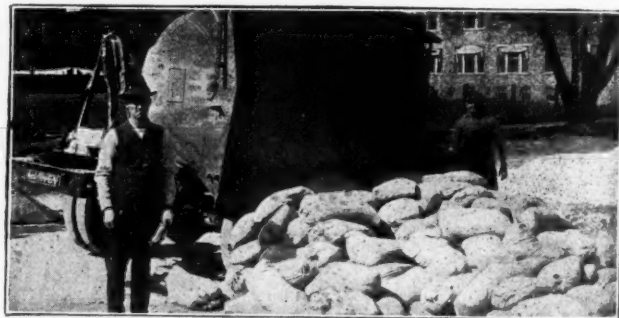
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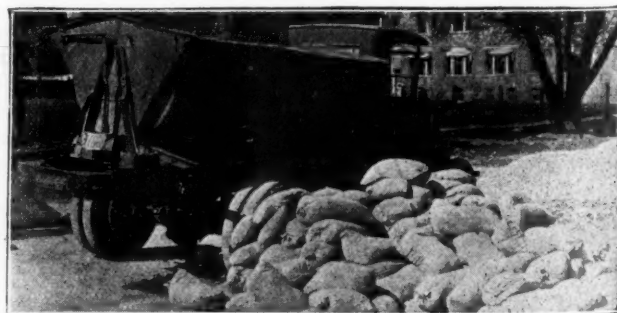
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Published Weekly by MUNICIPAL JOURNAL & ENGINEER, Inc., at 243 West 39th Street, New York  
S. W. HUME, President. J. T. MORRIS, Treasurer. A. PRESCOTT FOLWELL, Secretary

Volume XLVI

NEW YORK, APRIL 12, 1919

No. 15

## Subscription Rates.

United States and possessions, Mexico and Cuba.....\$3.00 per year  
All other countries ..... 4.00 per year

Entered as second-class matter, January 3, 1906, at the Post Office at New York, N. Y., under the Act of Congress of March 3, 1879.

## Change of Address.

Subscribers are requested to notify us of changes of address, giving both old and new addresses.

Telephone (New York): Bryant 9591  
Western Office: Monadnock Block, Chicago.

A. PRESCOTT FOLWELL, Editor  
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## Contributed Articles and Reports.

Contributions suitable for this paper, either in the form of special articles or as letters discussing municipal matters, are invited and paid for.

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## Information Bureau.

The Information Bureau, developed by twenty-one years' research and practical experience in its special field, is at the command of our subscribers at all times and without charge.

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## MUNICIPAL BONDS.

Apparently this season is to be almost if not quite a record maker in the matter of municipal public work. No matter how much work is planned, ordinarily the funds for it are not raised until the carrying out of the plans is certain. Last month \$52,000,000 worth of municipal bonds were issued, which is almost exactly twice as much as in March, 1918, and has been exceeded by the March output only twice during the last ten years.

The bond sales during January and February had not begun to indicate this great change in the aspect of the country concerning public work, having been considerably below normal, but the March sales have brought the total for the three months well above \$97,000,000, which is about the average for the first quarter during the past ten years. There is every indication that the next two or three months will see an even larger output of municipal bonds. In fact, the amount of work to be done will apparently be limited by the ability to place contracts rather than by scarcity of funds.

## WATERWORKS PRICES.

During the past two years water departments have kept their expenditures at the lowest limit possible, partly because of inability to get materials and partly because of high prices. Restrictions on materials are now removed, and prices have reached the point where it would seem that immediate steps should be taken to catch up with the maintenance and extension schedules. Iron, lead and copper go to make up by far the largest part of the machinery, pipe lines, valves, meters, etc., that constitute the largest part of the purchases made by water departments. Lead is selling at \$5.25 a hundred pounds in New York, which is approximately the pre-war price. Copper is down as low as it can be expected to go. As for iron, while the price of this has by no means fallen to what it was two or three years ago, the recent reduction arranged for by the Industrial Board of the Department of Commerce has brought it to a point where it will probably be held during the balance of this year. All authorities seem to agree that there will be little if any lowering of wages during the next year. There would therefore seem to be no reason why water departments should further postpone work which is at all necessary for the proper maintenance of the plant or rendering of adequate service by it.

## RETURNS FROM REFUSE.

Los Angeles cleans the streets in its business district by means of patrol sweepers, the sweepings being collected by pick-up men with a team and dump wagon, or a 2-ton motor truck with a 4-yard dump body. These



sweepings are delivered at dumping stations of local fertilizer companies, who dispose of it in the agricultural districts of the county. Last year the city received \$531 a month for these sweepings.

"Green garbage" collected by the city forces is sold to the Pacific Reduction Company, at a plant within the

city, for 51 cents per ton. The cost of collecting last year was \$3.54 per ton for that collected by day teams, \$1.91 by night teams, and \$4.19 by trucks. These costs include overhead. The night shifts serve the business and close-in districts, the day shifts the residential districts. The trucks are used for outlying districts.

## OAKLAND MUNICIPAL GARAGE AND SHOP

**Fifty-three Cars Regularly Maintained and Others Repaired Occasionally—Maximum Economy and Efficiency Aimed At—Purchasing and Handling Materials—Records of Materials, Operations and Performances—New Equipment Constructed.**

By C. W. GEIGER.

The city of Oakland, Calif., operates a municipal garage and, in connection with it, a repair shop where are maintained and repaired all of the automobiles used by the various city departments. Comparisons have been made with costs in other cities that operate municipal garages and also with those of large public service corporations and mercantile establishments, and such information as can be obtained indicates that in none of these are the cars maintained and operated at a lower cost. The economy and efficiency of the Oakland plant is being steadily increased, the fiscal year 1917-1918, when compared with the year 1915-1916, showing a saving of one-half cent per mile in the maintenance of automobiles despite the advance in labor and material.

For the latter fiscal year the average mileage of the fifty-three cars was 7,874 miles, ranging from 425 to 23,207 miles. The cost per mile averaged 5.8 cents, the maximum being 12.6 cents and the minimum 3.2 cents; less than half showing a cost in excess of 6 cents. Of these cars 29 were roadsters, 19 touring cars, 4 trucks, and 1 phaeton. The miles traveled per gallon of gasoline averaged 13.14, ranging from 19.89 to 6.23.

There are three hostlers, each receiving \$100 per month, whose duties consist of seeing that the automobiles are properly supplied with gasoline and oil, and are washed when necessary, the intervals between washings averaging about three months. Each hostler is responsible for 22 cars. In case a car is wanted at the city hall in a hurry by a department head, it is delivered by one of the hostlers; but as a rule each department head calls at the garage for the car wanted, since the garage is only a short distance from the city hall.

Each machine housed in the garage is given a number, fitted with a speedometer and an exact record kept of both the machine and the tires. Between its arrival at night and when it leaves in the morning, each car is gone over by a machinist, the alignment of wheels is looked after and the whole car is seen to, be in good running order. Constant attention to alignment of wheels has increased the mileage of tires and reduced the cost of tire repairs.

Gasoline for the cars is bought in open market and stored in two underground tanks with a combined capacity of 560 gallons. About 3,000 gallons is used each month. In 1918, 33,970 gallons were used by all of the automobiles, not including the police and fire department cars. When cars from these departments are repaired, however, their tanks are always filled with gasoline, and 2,513 gallons were supplied to these outside cars in this way last year.

Lubricating oil is stored in tanks, of which there are two in each garage, which are provided with self-measuring pumps. The oil is delivered in bulk or in barrels and is pumped into the storage tanks. A good grade of paraffin is used and is giving excellent results.

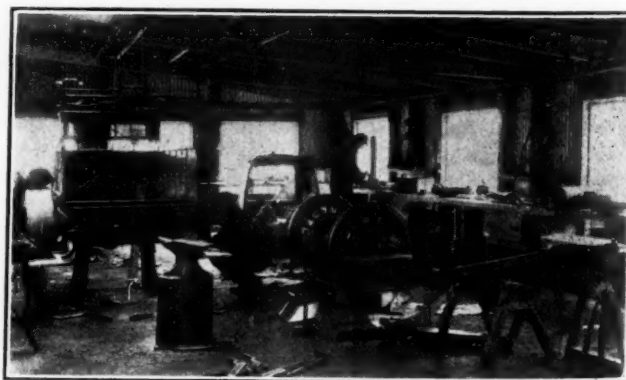
The hostler checks the gas and oil given each car

daily, using a card system on which is entered the name and number of the car and the name of the driver. Speedometer readings are taken twice a month for the purpose of keeping record of tire mileage and gasoline and oil consumption. The record shows that the city gets an average of 9,800 miles per tire for pneumatic tires on all kinds of cars. The average cost of tire per mile is 0.32 cent.

Each driver on taking out a car of any kind from the garage must sign an "in and out" register located in the garage, giving the time of leaving and returning. The regular service hours are from 8 A. M. to 6 P. M., and if a car is out beyond these hours the reason must be filled out in the space provided for the same in the register. The aim of this is to prevent joy-riding by the city employees. These registers are collected daily and filed for reference. If a driver finds that his car needs any kind of repair, he places a check mark opposite the repair needed on a municipal garage "Repairs or Attention Needed" sheet. On this sheet is printed a list of practically all the troubles likely to occur. This slip is given to the superintendent or to the man in charge.

The "Repairs or Attention Needed" sheet contains spaces for the date, car number, name of driver, department, and a list of items to be checked off, these items being:

Motor misses fire on magneto, motor misses fire on battery, motor starts hard, motor has noticeable loss of power, motor has knock or pound, steering gear connections need repairs, foot brake needs taking up or relined, emergency brake needs attention, spark plug cracked, repair ignition wires, master vibrator sticks, carburetor leaks, horn does not blow, skid chains broken, put on new tire, pump up all tires, car taken in for repairs—date, repairs finished—date, straighten fender, presto-lite tank empty, radiator leaks, hose connections leaking, fan belt is broken, transmission needs attention, car slips in low, car slips in reverse, clutch slips in high, valves need grinding, ammeter does not register, dry cells weak, gasoline tank leaks, gasoline pipe leaks, distilled water in battery, repair windshield, overhaul motor, general overhauling, repairs made as



INTERIOR OF MACHINE SHOP.

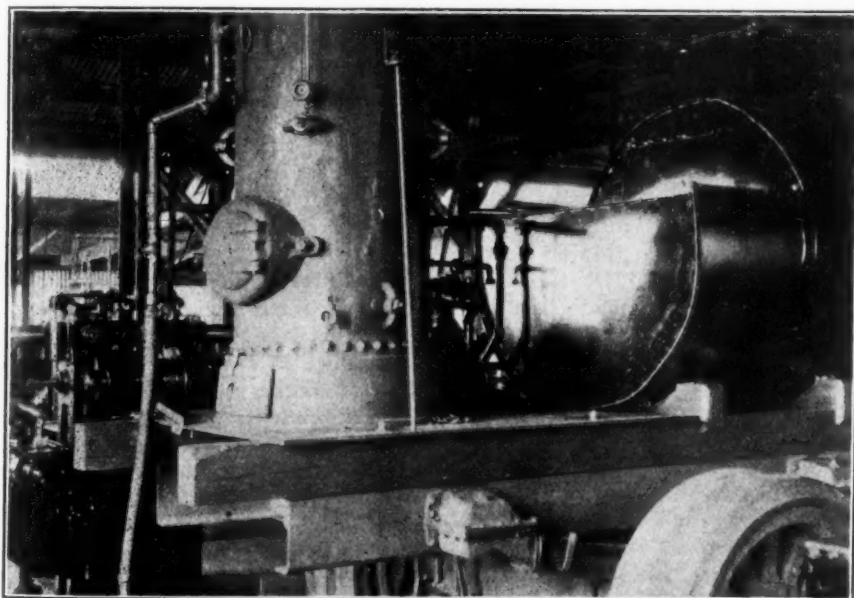
Combination hose and chemical wagon under construction. In the right foreground, the nozzle outlet and 4-hose inlet.



checked, repairs made by, motor overhauled by, miscellaneous.

The "Garage Labor and Material" blank contains spaces for "Make," "Driver" and "Auto No.," a horizontal line for each day of the month, with vertical columns for "Speedometer Reading," "Hours," "Gals. Gasoline," and "Pints Oil." At the bottom are entered a list of materials used, with dates, and the signature of the hostlers.

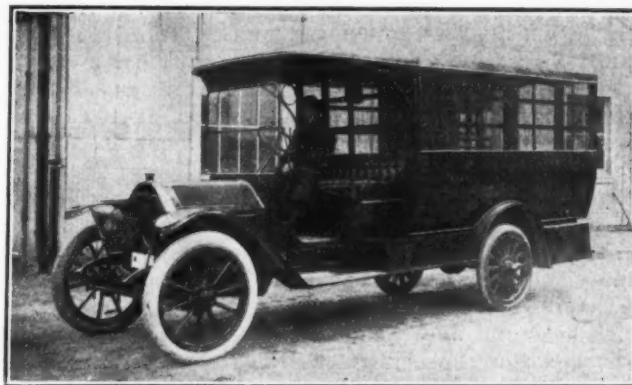
The annual "Maintenance and Operation of Automobiles" sheet gives a line for each automobile, with vertical columns headed "Make," "Department," "Labor," "Materials," "Hostler," "Gasoline, gallons," "Gasoline, cost," "Oils," "Tires," "Tubes," "Repairs, tires and tubes," "Other supplies," "Overhead," "Total cost," "Mileage," "Cost per mile," and "Miles per gal. of gasoline." The totals for one year gave costs per mile varying from 3.2 cents to 12.6 cents; and mileage per gallon of gasoline from 19.89 for a roadster of the Street Department, to 6.23 for a truck of the Electrical Department. As a general thing, all of the poorer records were made by cars other than the standard Fords and Cadillacs, of which there were nine out of the total fifty-three.



OIL SPREADER AND HEATER UNDER CONSTRUCTION.  
Boiler and tank mounted on cradle, permitting quick removal and replacement with dump body.

The shops connected with the garage include a complete machine shop, blacksmith shop, wood-working shop and paint shop. There are two garages, which provide storage for sixty cars belonging to the Departments of Streets, Health, Parks, Playgrounds, Harbor, Engineering, Auditors, Electrical, Building, and Public Affairs. There are seven other automobiles owned by certain departments which are parked outside because of the necessity of frequently taking them out at night. In addition to these automobiles, the garage maintains and repairs twenty-four pieces of motorized fire apparatus, twenty cars operated by battalion chiefs, twenty-one cars operated by the police department and two patrol wagons. The police and fire departments occasionally make some small repairs on their apparatus, in shops that were equipped before the municipal garage was established, but eventually all this work will be done at the central shops.

The garage and shops are under the supervision of the Street Department and are in charge of a superintendent, under whom are employed nine machinists, three host-



PRISON VAN CONSTRUCTED BY MUNICIPAL SHOP.  
Second-hand Cadillac chassis, lengthened and Torbeson gear drive and two-ton rear axle added. Three longitudinal seats. Will carry 22 men.

lers, two blacksmiths, two painters, one wood-worker and one trimmer. It is expected within a short time to house the shops in a three-story reinforced concrete building, 200 feet square, the first floor to be occupied by the garage, with a runway leading to the machine shop on the second floor, from which floor elevators will run to the top floor. At present the machine shop is housed in a corrugated iron building 62x65 feet.

#### MACHINE SHOP.

The equipment consists of three lathes, a 20-inch, a 16-inch, and a 12-inch; a 20-inch shaper; a 36-inch radial drill, a 20-inch drill and a speed drill; a universal milling machine; a power hacksaw, and two emery wheels. All the equipment is driven from a line shaft, the power being furnished by a 5 h. p. electric motor. There is also a Rex air compressor operated by a small electric motor, by which compressed air is maintained at 150 pounds, which air is piped through the machine shop as well as the garages and is used for filling tires and, in connection with distillate, for cleaning engine parts. There is also a portable electric drill in the machine shop capable of drilling a hole up to one-half inch, sockets for plugging-in being

placed throughout the shop. The shop is lighted by both windows and skylights, and twelve 48 c. p. electric lights are provided for night work. Fire extinguishers are located throughout the building and every precaution made to guard against fire.

By utilizing the expert advice of the garage superintendent, the city has purchased a number of second-hand cars at considerable profit to itself. These cars are taken to the shop and put in the best of condition for use. Except a few that cost \$1,000 each, all cost less than \$500 and some as low as \$200. For two cars alone the city paid \$1,800 less than the cost of new cars to do the same work, and on account of the high class of the cars it is believed that ultimate saving will be even more.

#### APPARATUS CONSTRUCTED.

A number of different pieces of apparatus have been and are being constructed in the municipal shop, these including fire apparatus, trucks, etc. There are now under construction an oil spreader for penetration work on the streets, which will consist of a five-ton Fageol chassis which was purchased new, on which is being

mounted a tank, boiler and pump, all bolted to a heavy cradle which can be removed quickly from the chassis and replaced by a dump body. The tank has a capacity of 600 gallons; the boiler was taken from an old horse-drawn vehicle and will provide steam at 100 pounds pressure for heating the oil and also will operate a double acting piston pump for pressure delivery of the oil through the spraying nozzles. The operator will stand on a platform built on the rear of the truck.

There is also under construction a combination hose and chemical wagon to be used in connection with the high pressure system. It will carry 1,500 feet of three-inch hose and two chemical tanks. On the rear will be installed four hose inlets leading to one outlet nozzle having a universal joint, thus furnishing a stream of large volume and pressure. The truck will carry six men, three on the rear running board, two on the side running boards, and the driver. A second-hand truck that cost \$325 is being used in constructing this combination wagon, the cost of which complete will probably be within \$1,800. The tanks and sides were taken from an old horse-drawn chemical.

Work will soon start on motorizing a steam engine using a Christie front-drive tractor. During the past year three tractors have been constructed for horse-drawn ladder trucks, 32 h. p. Cadillac motors being used, new Torbeson two-ton rear axle and fifth wheel making these into six-wheel vehicles that are capable of traveling twenty-eight miles an hour.

During the past fifteen months three Fords have been equipped with Ralston truck attachment and specially designed four-yard dump bodies, which are employed in picking up the contents of the street sweepers' cans and hauling them to the dump. The bodies are raised with a cable hoist operated by hand. These trucks cost not over \$800 each.

The machine shop has built also three trucks for the sewer repair crews, using second-hand Cadillac chassis and installing a small wagon bed in the rear of the seat capable of carrying about 1,500 pounds of material such as sewer pipe, cement, brick, shovels and other tools. Each truck carries a driver and assistant. They answer complaints and during the rainy season are used day and night in cleaning choked sewers and culverts. A truck of the same type was built for the gutter and curb repairing crew.

Two patrol wagons were built, one fifteen months ago and the other six months ago, using Cadillac chassis, 1913 models. The bodies were made at the municipal shop and all necessary changes to the chassis, the cost not exceeding \$1,800 each, or less than half of the cost of similar equipment. The older of these patrol wagons has traveled 18,000 miles and has cost less than \$100 for repairs. These wagons are now operating on less than six cents per mile. They are used for both police duty and ambulance calls. They carry two stretchers, also a first-aid outfit in a special compartment built in the front of the body. They have a speed of 48 miles an hour.

#### RECORDS AND ACCOUNTS.

A stock room is operated in connection with the machine shop. Here are carried parts for all of the makes of cars in the various city departments. It is the aim to standardize all of the municipal cars into two makes, Fords and Cadillacs, and all cars now being purchased are of these types. An advantage of this standardization is that repair parts for only two makes of cars can be carried much more economically than for a larger number of makes. Another advantage is that drivers become more familiar with the operation of the cars when there are only two makes; also the machinists become

more proficient in repairing. All specials are charged off of the stock inventory as they are given out, and are also charged by the machinist on his time and material sheet, thus giving a double check for all stock used.

A machine shop time and material sheet is provided on which each machinist checks his own time daily. This sheet contains spaces for "Job" (name and number of car etc.), "Dept.," and "Week ending." The sheet is divided into one part for labor and one for material used. The former has vertical columns for the name and occupation of the employe, one for each day of the week, "Total hours," "Rates per hour" and "Amount." Under "Material Used" are columns for "Article," "Quantity," "Cost," "Total," and "Remarks." This plan requires only one card a week and makes it very simple for the superintendent to check the daily time. The sheets are kept in special racks numbered to correspond with the different cards.

Once a month the superintendent charges the hours and cost of labor and material and the garage costs on a garage invoice. The "Garage Invoice" blank provides spaces for the invoice number of the issuing department and that of the receiving department, the units, rate and total for "Hours labor," "Overhead expenses," "Pounds of babbitt," and of steel, bronze and cast iron; "Gals. of gasoline," "Pts. of oil," "Qts. of trans. oil," "Lbs. of grease." Also, under the head of "Garage," Hours of labor, overhead, tires, tubes, repairing tires, repairing tubes; under the head of "Body and Bows," items of hours of labor, and the same under the head of "Top and Curtains"; and under the head of "Painting," items of hours of labor and pints of varnish. There are also spaces for the total cost for the month, "Miles," "Main Cost," "Cost per mile," "Car No.," "Make," "Dept." and "Driver." Two copies of the invoice are made, one being sent to the department having the supervision of the car, and the other being retained by the superintendent for reference in case of dispute. The invoice is made at the end of the month and requires the spare time of the superintendent, amounting to about a day and a half. From these invoices there is prepared a yearly table which shows the total account as charged to each machine. These records are kept for the double purpose of checking the efficiency of the garage, car and driver, and also to serve as a basis for apportioning the cost in the various departments.

An efficiency report is made out monthly and posted in the main places of employment, where the men congregate, so that all can see each others' records. This is made out by the foremen of the different departments. The "Efficiency Report" is contained on a sheet, the vertical columns of which provide a column for each day, one for the names of the employes, and others for "Average Rating," "Weights," "Net Positive Mark" and "Total Positive Mark Demerits for Month Net Efficiency." Four horizontal lines are provided for each employe, on which are entered for each day "Demerits," "Ability," "Quantity of Work," and "Reliability." The weights used in combining the gradings vary with each kind of employe. Each man must maintain an average of 70 to remain in the employment. This has a tendency to produce conscientious work by the individual workmen. In case of dispute in regard to any markings, the employes have the privilege of appealing to the Civil Service Commission, and in case of error the commission has the matter rectified.

All employes are under the Civil Service, and wages and other conditions are equal to those in outside plants. The men are paid a monthly salary and are not docked for sickness. Four machinists receive \$160 each per



month and five receive \$150 per month. Here each man has a life position as long as he remains efficient. Knowing this, the workmen take a personal interest in the plant and the work, resulting in increased efficiency. The men here are better satisfied than the majority of outside workmen; strikes and labor disputes being taken up direct with the Civil Service Commission and adjusted.

## REFUSE DISPOSAL IN LONDON

### How St. Marylebone Screened Its Refuse, Recovered Paper and Other Salable Materials, and Used a Clay Pit for Dumping.

St. Marylebone is a borough of London, England, with a population of about 120,000. Prior to March, 1917, the house refuse had been collected and disposed of by a contractor for a lump sum, but owing to increased costs, scarcity of labor and other difficulties, the contractor asked for a 50 per cent increase, which was granted, but when an additional 25 per cent was asked for the borough council decided instead to have the work done by the borough authorities direct, and the engineer of highways of the borough, James Gair, was placed in charge. The following account is condensed from a description of the work given by him before the Institution of Municipal and County Engineers a few weeks ago.

The council had no horses or plant available and it was decided to purchase ten 2-3 ton motor trucks fitted with special tipping bodies, and twenty horses; also to purchase and hire refuse wagons. The motor trucks were commandeered by the war department before they were delivered to the city, and refuse carts were hired or borrowed from two of the other boroughs until motor trucks were obtained some months later. Nearly all of the employees of the former contractor were taken over by the borough.

As the borough had no destructor, it was decided to dump the rubbish in a disused clay pit about two acres in area and about thirty to forty feet deep located about ten miles by canal from a wharf in Paddington basin (Paddington is an adjoining borough), which wharf was within a three-mile radius from any part of the borough. Twelve canal boats were purchased with a capacity of 40 to 45 tons of refuse and a tug operated by oil engine to transport them. At the clay pit the refuse was unloaded from the canal boats by hand labor onto dump cars and carried on a 27-inch gauge railway about two hundred yards to the dumping point. A five-ton locomotive crane with an unloading grab bucket was installed later and effected more economical and expeditious unloading.

This work was taken over in April, 1917, and in August of that year the borough purchased the leases of a group of wharfs on the northern side of Paddington basin, which had been used by the refuse contractors, who had erected there, some twenty years or more ago, a refuse screening plant. The buildings and plant were in a most dilapidated condition, not having been used for a long time, all the machinery was badly in need of repairs and it was not until the end of October that the plant could be put into anything like working order. At that time the main idea was to recover the waste paper, which was very plentiful, and the tin cans, and to obtain a residue that could be disposed of more economically than by conveying it all unsorted to the dumping point. This plant has been in operation since November, 1917.

The screening plant consists of an iron grating about

36 feet long and 9 feet wide onto which four refuse trucks can dump simultaneously. The bars of the grating are about two inches apart. All of the refuse is dumped onto this grating and the old tin cans, paper, rags, bones and all salable materials are picked off. The finer materials fall between the bars onto a conveyor, which discharges them onto an oscillating flat screen eight feet long by four feet wide, the bottom of which is formed of steel plates perforated with 7/16-inch holes. The material which passes through the screen is termed "fine ashes" and is sold to market gardeners and farmers. The material passing over the end of the screen is called "breeze" and is really a low-grade fuel and is sold as such. Experiments with washing breeze proved so satisfactory that a mechanical washer capable of dealing with forty to fifty tons a day was ordered last May but is not yet built.

In order to recover the paper mechanically, the discharge from the screen is conveyed into a wooden box at the top of which is fixed a fan driven at about 1,500 revolutions per minute, which sucks up the paper and discharges it into a basket. The author could not state whether this method would prove successful as the fan had just been put in place. The power to drive the plant is obtained by burning under a Babcock boiler the waste refuse collected from the grating.

The tin cans are put through a desoldering furnace and pressed into bales by means of a hydraulic press. The desoldering furnace cost \$450. The waste paper also is baled by means of a hydraulic press. Rags are sorted and packed into sacks. Bottles are sorted and disposed of to various firms. During the year from November, 1917, to October, 1918, the borough sold the following materials: 402 tons of waste paper, bringing \$17,090; 12½ tons of bones, bringing \$850; 28½ tons of broken glass, bringing \$375; 1,000 gross of bottles, bringing \$1,705; 78 tons of rags and sacking, bringing \$3,290; 334 tons of old tins and scrap iron, bringing \$3,315; fine ashes and breeze, bringing \$2,830. This gives a total return from all the refuse of \$29,455.

The capital outlay by the borough for motors, trucks, horses, barges, tugs, steam-crane, acquisitions of wharves and screening plant was about \$75,000, and the working cost for the year ending March 31, 1918, was about \$100,000. It was not claimed by Mr. Gair that the arrangements were ideal, but it is to be considered that the entire working out of the plan was completed within six weeks, war conditions made the obtaining of new apparatus difficult or impossible, and it was necessary to use what could be obtained.

In view of the prospect of an early return to more normal conditions, the question arises whether these results can be maintained. In any case, however, it is the duty of every municipal engineer to consider carefully whether some system cannot be devised for recovering the waste materials that pass through his department. Whether this can be done best by compelling each household to separate the organic and inorganic waste or by screening and sorting at one point, is a matter for investigation in each case.

Several members of the Institution of Engineers discussed the paper, one bringing out from Mr. Gair, in reply to a question, that he did not consider the plant at the wharf as the best way of handling refuse, his idea being not to have a grate at all, but to dump the refuse into a pit, from which it could be lifted by means of a grab bucket and placed on a belt or screen. He had considered replacing the present flat screen with a rotary screen, but had decided against the latter because, while

it was possible to rotate the screen, it was not possible to rotate the refuse. He had considered sorting the paper recovered, but it was so dirty when received mixed with the other refuse that he did not think it would pay to sort it.

A representative from Hampstead said that, while a few years ago destructors were regarded as the best means of disposing of house refuse and were undoubtedly sanitary, he believed that they had come to be considered as very costly. At any rate such was the case in London. Hampstead had been one of the first boroughs to erect a destructor, but last year the council completely stopped working the destructor and it was sold this year to a neighboring factory for \$35,000. In the meantime he had been sending the refuse into the country. He is now preparing a plant for screening the material, passing it onto a traveling belt from which the valuable articles would be picked off, and pulverizing the remaining material. He was designing to use the smallest amount of manual labor possible.

### STREET LIGHTS IN COLUMBUS.

During 1918 the municipal electric light plant of Columbus, O., replaced all the old-style carbon arc lamps on the street lighting circuits by 400 c. p. gas-filled lamps. Acting superintendent Lewis Rowe reports that the new lamps consumed only about one-half the current and required about one-half the labor for renewals and upkeep with approximately 25 per cent more light as compared to the arcs. Although the cost of current in 1918 was 3.006 cents per kw. h. as compared with 2.28 cents in 1917, the cost per street lamp decreased from \$45.28 in 1917 to \$27.94 in 1918. However, the saving in labor and current consumed was lost in a great measure by a great many lamps burning out whenever a swinging hot ground or an open circuit occurred while the lamps were in service. "We have lost from 50 to 70 lamps from this cause at one time when a bad case of trouble occurred, and I might add that during the months of November and December, when there was a great deal of wet and stormy weather, we lost 1,500,

or one lamp out of every two on the lines. As these lamps cost \$2.76 each, the cost of their replacement was \$4,140, exclusive of labor.

"The loss of so many lamps was due to surges in the lines to which they were connected at the moment the break in the circuit occurred when it opened and, in the case of the swinging hot ground, at the moment of contact and break between the circuit and the ground whenever they would swing together. The remedy for this is to install on each lamp a device called an auto-transformer, which has the effect of choking back the current so that a surge of 100 per cent through the circuit will only amount to about 25 per cent or 30 per cent through the lamp. Experimenting with thirty of such coils on the lines during the last two or three years, we have found that the loss of lamps amounted to one or two per year for each installation when the coil was used. These coils paid the cost of installing them during the first year they were used, as the lamps only lasted from two to four weeks before the coils were used. The cost of these auto transformers at the present time is \$3.97 each and the cost of installing them would amount to about \$1.00 more, making the total cost approximately \$5.00 for each unit installed.

"This department recommends that these auto-transformers be installed on every series street lamp in the city of 250 candle power and over, as they will pay for their installation in the saving of lamps alone in two years' time at the most, and also increase the efficiency of the street lighting service at least 50 per cent by the decrease in the number of outages caused by lamps burning out. What the saving will be by use of the 400 c. p. lamps over the old arc lamps we cannot say at this time, due to the fact that they have been used on the old arc lamp transforming regulating sets during the year 1918 and also have been operated on the same circuits mixed in with the arc lamps during the greater part of the year; but with auto-transformers installed on each lamp to protect it from surges, they will no doubt operate at a greatly decreased cost than during the past year."

## REGULATING CHLORINE DOSES

### Adjusting Size of Dose to Character and Condition of Water Treated—Conclusions from Experiments by Maryland Health Department—Color and Turbidity Impracticable—Five-Minute Absorption Test Recommended.

It is probably quite generally realized by waterworks superintendents and others who use chlorine for the disinfecting of water that the application of different amounts of chlorine is necessary for the safe and economical treatment of waters of different characteristics or conditions. A few well-controlled experiments on certain waters have led to the universal adoption of chlorination of waters differing materially from those upon which earlier experimental data were made available, and the doses adopted as standard from those experiments have been found to be inapplicable to many of the waters treated.

This subject of the adjustment of the rate to the water being treated is discussed by Abel Wolman and Linn H. Enslow in a paper in the *Journal of Industrial and Engineering Chemistry*. The data upon which many of the conclusions are based were the result of a study to which the writers were detailed under the general direction of R. B. Morse, chief engineer of the Maryland State Department of Health.

The writers state that "In the supervision and control of a single water supply, the problem of chlorination

offers far less difficulty than in the case of a group of water supplies, all of which have distinctive and disconcertingly variable qualities. The control of disinfection of a city water supply, supported by daily chemical and bacteriological examinations, may at least approach a scientific procedure, although surprisingly few cities even at this late date actually do more than a superficial dosing at a more or less constant rate."

The State Board of Health desired if possible to develop some basis on which they could advise the various cities in the state concerning the proper dosing of their several water supplies for the sterilization of them. Such advice was being asked for and "a speedy, safe, easy method of antecedent control, rather than of subsequent failure is essential." "When we bear in mind that a number of supplies are under the supervision of laymen, it becomes clear that consistently good results in disinfection are hardly attainable without the use of some presumptive indicator of an efficient chlorine dose."

The authors do not pretend to offer any established method, but merely submit the results of their tests and some conclusions therefrom, which, if demonstrated



by further investigations to be sound, may form the basis of such general method. They apparently are tentatively of the opinion that a five-minute test of the chlorine absorption of the water in question, if used with a low factor of safety, can be used in determining from time to time the chlorine dose necessary for effective treatment.

"Some experimenters assert that the amount of absorption discloses little concerning the destruction of bacteria, while others assume that the chlorine consumed in oxidizing organic matter and sometimes ferrous salts or sulphides will not effect sterilization. Since the latter assumption necessarily permits an increased factor of safety in the control of the chlorination, it is probably advantageous to use the hypothesis as a basis, until the collection of adequate data indicates what quantitative variations therefrom may be necessary."

#### COLOR AND TURBIDITY.

If the color of the water could be used as a presumptive indication of the amount of chlorine that such water would absorb in a given period, the convenience of this method is apparent. From experiments made by the authors, however, they concluded that even "for the same water supply, changes in color are not necessarily concomitant with variations in chlorine absorption," while for different water supplies the use of color in this way would seem to be entirely impracticable; this being because of the absence of any adequate conversion factor, even supposing that there is any relation between the two.

It is a widely entertained idea that the amount of chlorine required will vary with the turbidity of the water. The authors made a study of the Potomac river water in this connection, examining 350 samples during June and July, 1918.

"A study of the turbidity readings and the chlorine absorption tests indicates practically no correlation whatever between these two phenomena, although the turbidities ranged from 0 to 90 parts per million. The Potomac river water at the above station offers an interesting illustration of the necessity for guarding against unwarranted correlations between the physical property of a water and its biochemical conduct. In the case of the above water, the chlorine absorption values (during five minutes) showed no increase whatever with increases of turbidity, but rather a slight decrease. That the absorption remained almost constant and even decreased, in a degree, with an apparent physical degradation of the water is probably explained by the fact that the Potomac river at the point under discussion contains considerable oxidizable mine wastes. Sudden rainfalls create dilutions of these wastes, but at the same time raise the turbidity readings on the river. It comes about, therefore, that the increased muddiness in the water is in reality accompanied by a reduction in oxidizable material, without a consequent increase in chlorine absorption values. The situation is somewhat analogous to the reductions in alkalinity frequently observed with rises in turbidity. It is clear from the above situation that the direct variation of dosage with increase of turbidity would have been fallacious and contrary to the demand of the water. When the attempt is made to correlate turbidities of different waters with their corresponding chlorine absorptions, even less success is experienced. This situation is to be expected in different supplies, because of the variance in character and degree of watershed pollution."

The authors therefore conclude that the turbidity readings are not a safe index of chlorine absorption for different water supplies, but possibly may be adopted for

a given individual supply if sufficient precautionary measures be taken, based upon long continued studies of widely varying phases of this supply.

#### OXYGEN CONSUMED.

"Inasmuch as the oxygen-consumed values of waters represent approximately the oxidizable compounds present in such supplies, it would seem that this chemical index should bear some relation to the complex action of chlorine absorption, of which some portion at least partakes of the nature of an oxidation. In order to study this phase of absorption, a series of widely varying waters, of surface and underground types and of different rates of pollution, were examined. The results indicated a fairly close variation of chlorine absorption with the oxygen-consumed values, the correlation being independent of the source or nature of the water. The amount of chlorine absorbed in a definite time interval does not increase in direct proportion with the increase in pollution of the water as measured by the oxygen-consumed test, but the 5-minute rate of chlorine absorption shows a decreasing acceleration with increases in pollution.

This relation suggests the possibility of a 5-minute chlorine-absorption test as a substitute for the much longer oxygen-consumed test as a presumptive indicator of the quality of a water. It was found by the authors to be comparatively simple to differentiate between an underground supply of good quality and a comparatively poor surface supply by means of a chlorine-absorption test made in 5 minutes.

#### EFFECTIVE DISINFECTION.

It is quite generally assumed that the chlorine absorption in a definite interval bears some definite relation to the disinfection effected, but there is a wide difference of opinion as to what the relation is. In practice this relation is represented by a factor of safety applied to the amount of available chlorine absorbed by the water in question in a given time, the product giving a so-called effective chlorine index.

The amount absorbed varies with the time allowed, and a dose might be considered safe only if this time interval is amply sufficient to effect the destruction of the bacteria. Intervals of 3 minutes, 10 minutes, and even 30 minutes are advocated. The authors believed that their experiments showed that the relation between the results of 5-minute and 30-minute tests were so definite that the former are as reliable as the latter, a higher factor of safety being used in connection with the shorter test. They conclude that "increased safety in dosage is occasioned by the 30-minute test in those waters where the factor of safety is least essential, whereas little additional safety is gained in waters of higher initial absorption or in those where it is most necessary." They believe, therefore, that the use of the 5-minute absorption test is to be recommended for routine control of chlorination, with a constant factor of safety, as, for instance, 0.2.

#### CARD INDEX OF GATE VALVES.

The Engineering Department of Newton, Mass., performs numerous services for other departments, which is paid for by them, the amount so paid for in 1918 having been \$2,952.07. Of this amount, the Water Department paid \$856.40, part of which was for maintenance of the water services, including a card index of water service pipes to buildings, which is kept up to date.

The city engineer reported that during 1918 work on the card index showing measurements of the gate valves

was continued, good progress being made. The gate valves are located so far as possible by measurements from house, trees, poles or other prominent objects which are always apparent when the ground is covered with snow, which in this city is likely to occur on occasion to a depth of a foot or more. The measurements are all kept in notebooks, and subsequently a plan on tracing cloth is made to scale, if possible, traced from the 40-foot scale plans, showing the layout of mains in the vicinity of the gate and the tie measurements to the gate. These tracings are 4 inches by six inches in size, and blue prints are taken from them on heavy paper for the use of the water works employees. For indexing purposes, these plans show at the top the name of the street on which the gate is located, its direction from the nearest cross street, and the ward, date of location and note-book reference are also shown.

"The card index method of location of services and gate valves has proven satisfactory, as the cards may readily be taken from the files to be used by the workmen on the streets, and if lost or defaced are easily replaced from the original notes."

## CHLORINATION OF SEWAGE

### Tests at New Haven on Crude Sewage, Screened Sewage, and the Effluents from Imhoff and Activated Sludge Effluent.

In the experiments on sewage disposal conducted last year in New Haven and which have been referred to before in Municipal Journal, tests were made of the use of chlorine in reducing the bacterial content of crude sewage and plant effluents. "The effluents from the screen chamber, the Imhoff tank and the activated sludge process were conducted by wooden flumes to small baffled tanks giving detention periods of from 2 to 5 minutes, where they were chlorinated. The chlorine was applied in the form of liquid chlorine delivered from a Wallace and Tiernan solution-feed apparatus, designed for these experiments, with three solution jars and volumetric meters. The chlorinated samples were held in the sample bottles for 30 minutes before plating, to reproduce the action of the small storage tanks that would be required in an operating plant."

Twenty-seven tests were made in the application of chlorine to crude sewage, the amounts of chlorine varying from three to eight parts per million. Averaging the several tests, it was found that with three parts per million the total bacteria were reduced 87 per cent and the B. coli 55 per cent. With five parts, the total bacteria were reduced 96 per cent and the B. coli 99 per cent; while with eight parts, the total bacteria, were reduced 99 per cent and the B. coli 94 per cent. (No explanation is offered of the lessened effectiveness of the chlorine in reducing B. coli with an increase in the dose.)

Testing screened sewage it was found that, with three parts of chlorine per million, the total bacteria were reduced 88 per cent and the B. coli 48 per cent; with five parts the reductions were 99 per cent and 97 per cent respectively; and with seven parts per million both total bacteria and B. coli were reduced 99 per cent.

In treating Imhoff effluent, the results obtained with three parts per million were 99 per cent and 65 per cent respectively, while with six parts per million the reduction was 76 per cent and 84 per cent respectively. "The unstable organic bodies which result from septic action tend to use up a considerable portion of the

chlorine before it can act on the bacteria," and this probably accounts for the less effectiveness of these tests with Imhoff effluent, and possibly for the irregularity also.

"The effluent from activated sludge treatment is particularly amenable to further purification by the use of chlorine, since its original bacterial content should be already reduced and since its free oxygenated condition leaves the chlorine free to exert a maximum disinfection action. The activated sludge process, operated as we operated it, with a minimum degree of aeration, and acting on the abnormal East street sewage, yielded only a moderately purified effluent." With an addition of two parts of chlorine the total bacteria were reduced 78 per cent and the B. coli 88 per cent. In the three samples tested with three parts of chlorine, the activated sludge process had already reduced the number of B. coli 73 per cent and no further reduction was effected by the use of chlorine.

Summing up their conclusions in regard to chlorine treatment of sewage, Professor Winslow and F. W. Mohlman, the chemist of the experiment station, report as follows:

#### CONCLUSIONS IN REGARD TO CHLORINATION.

"It appears evident that 3 parts of chlorine will yield fairly satisfactory results with the effluent of the activated sludge process; that 7 or 8 parts are needed for crude sewage; that 5 parts will probably suffice for screened sewage; and that, so far as the Imhoff effluent is concerned, 6 parts will not give satisfactory results as to total bacteria, but may yield an effluent which is low in colon bacilli.

"In making our estimates as to the cost of chlorination combined respectively with fine screening and with Imhoff treatment, we have assumed, in the absence of more conclusive data, that 5 parts of chlorine will produce a satisfactory degree of purification in both instances, basing this assumption chiefly on the results of the colon tests which are of much more practical moment than the counts of total bacteria. It is evident, however, that this amount may very possibly have to be increased in practice, particularly in the case of the Imhoff effluent."

The cost of chlorination in each case is estimated at \$4.05 per million gallons.

## NEWTON SEWERAGE NOTES.

The entire sewage of the city of Newton, Mass., discharges into the outfall sewer of the Metropolitan Water and Sewerage Board, for which the city paid the board in 1918 \$15,026 for maintenance of the metropolitan sewer, \$9,254 for sinking fund and \$40,799 for interest on its proportionate part of the cost of said sewer.

The area served by the sewerage system is seven and three-fourths square miles, and about 40,000 population is served by the 130.4 miles of house sewers. (In addition to this there are a little over 63 miles of storm sewers.) The total number of buildings connected is 7,688. In the system are four inverted siphons, 3,359 manholes and 280 direct connections with water mains for flushing. The house connections are all five-inch or six-inch and total 99.37 miles in length. They are laid by city forces at an average cost of \$1.25 per lineal foot, which cost is paid by the abutting property.

Some of the sewage needs to be pumped in order to get it into the Metropolitan system, which pumping is done by means of two 2½-inch centrifugal pumps operated by two 6 h.p. gasoline engines, and one 4-inch



centrifugal pump operated by a 10 h.p. motor. During 1918 a total of 25,214,500 gallons of sewage was pumped at a total cost of \$2,251.28, of which \$308.83 was for gasoline, \$518.15 for electricity and \$1,424.30 for other expenses. The total amount of gasoline consumed was 1,235 gallons.

During the year there were 220 stoppages in the 130 miles of sewers; 129.78 miles of sewer was cleaned and repaired at a cost of \$9,765.59. Flushing the system cost \$2,751.56.

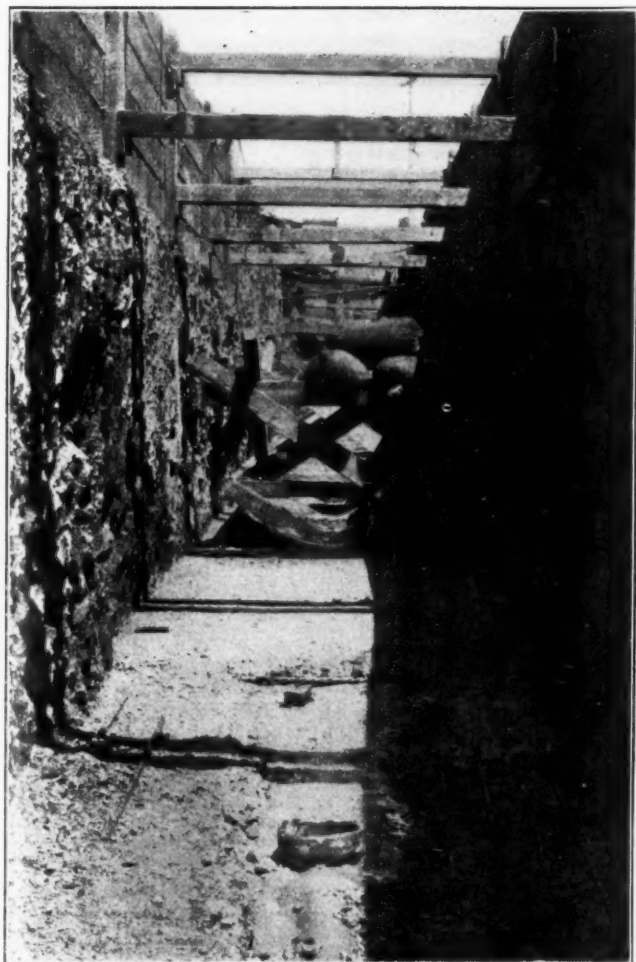
The cost of constructing the sewers is borne partly by the abutting property, assessment being made at the rate of 20 cents per lineal foot of frontage plus one cent per square foot of area drainable to the sewer and lying within 125 feet of the street line. Of the total cost of the system, 37.2 per cent has been assessed on the abutting property.

### DRAINS IN SEWER CONSTRUCTION.

The use of drains as a method of removing ground water from trenches during the construction of sewers, which has been employed by contractors for a great many years, has been developed in San Francisco with some details a little out of the ordinary. In ground where the foundation is poor, the sewers are supported by piles, these being driven in the center of the trench for small sewers and in two rows along the sides of the trench for larger sewers. In each case a concrete bed is constructed the entire width of the trench and supported by these piles, longitudinal reinforcing bars being embedded in the concrete. Where the piles are placed in



SIDE DRAIN UNDER CONCRETE SEWER FOUNDATION WITH CENTRAL PILES.



CENTRAL DRAIN, WITH TEES FOR CLOSING.  
There is a row of piles along each side, under the reinforcing rods.

the center of the trench, the drain is placed along the side, and where there are two rows of piles along the sides, the drain is placed in the center. Broken stone is placed around and to a depth of two or three inches above the drain pipe, and the concrete foundation is placed upon this. The object of the drain pipe, is of course, to carry off the ground water that seeps into the trench in order that the concrete and other sewer construction can be carried on without interference from it.

In some cases it is not desirable to permit the drain to continue to operate after the construction of the sewer has been completed, and in such cases vertical T's are inserted in the drain at intervals of two hundred feet, facing vertically upward, and a corresponding opening left in the invert of the sewer when it is built around such T, the object of the opening being to fill the under drain with sand and cement after the sewer has been completed so as to prevent its continuing to carry off the ground water. Both side and center drains are shown in the accompanying illustrations.

### NOTICES PAINTED ON SIDEWALK.

The mayor of Bristol, Tenn., has adopted a novel plan for calling the public's attention to ordinances relative to keeping the streets clean. He has had two stencils made which will be used for painting on the sidewalks the following notices:

"Observe the Law: Do Not Spit on the Walks."

"Observe the Law: Do Not Throw Paper or Trash on Walk or in Street."

Mayor King believes that the public do not intend wilfully to violate the city ordinances, and has adopted this plan for the purpose of calling attention to these matters. Trash receptacles have been provided in the business section of the city.

## NEWS OF THE SOCIETIES

**April 14-19.**—UNITED STATES GOOD ROADS ASSOCIATION. Annual convention, Mineral Wells, Tex. Secretary, F. A. Rountree, Birmingham, Ala.

**April 16-17.**—AMERICAN WATER WORKS ASSOCIATION, IOWA SECTION. Fourth annual meeting, State University, Iowa City, Ia. Acting Secretary, J. H. Dunlap, State University.

**April 25-26.**—AMERICAN ACADEMY OF POLITICAL AND SOCIAL SCIENCE. Annual meeting, Philadelphia, Pa. Secretary, J. P. Lichtenberger, Logan Hall, West Philadelphia, Pa.

**May 6-8.**—NATIONAL FIRE PROTECTION ASSOCIATION. Annual convention, Ottawa, Can. Secretary, Franklin H. Wentworth, 87 Milk St., Boston, Mass.

**May 13-14.**—AMERICAN ASSOCIATION OF ENGINEERS. Annual meeting, Chicago, Ill. Secretary, C. E. Drayer, 29 South LaSalle St., Chicago, Ill.

**May 14-15.**—LEAGUE OF TEXAS MUNICIPALITIES. Seventh annual convention, Sweetwater, Tex. Secretary-treasurer, Frank M. Stewart, University of Texas, Austin, Tex.

**May 19-24.**—NATIONAL ELECTRIC LIGHT ASSOCIATION. Annual convention, Atlantic City, N. J. Secretary, T. C. Martin, 29 W. 39th St., New York.

**June 9-13.**—AMERICAN WATER WORKS ASSOCIATION. Thirty-ninth annual convention, Iroquois Hotel, Buffalo, N. Y. Secretary, J. M. Diven, 47 State street, Troy, N. Y.

**June 17-20.**—AMERICAN SOCIETY OF CIVIL ENGINEERS. Annual meeting, St. Paul-Minneapolis. Secretary, Charles W. Hunt, 33 W. 39th St., New York, N. Y.

**June 23-26.**—SOUTHWESTERN WATER WORKS ASSOCIATION. Annual convention, Coates House, Kansas City, Mo. Secretary, E. L. Fulkerson, 617 Washington St., Waco, Tex.

**June 24-27.**—AMERICAN SOCIETY FOR TESTING MATERIALS. Twenty-second annual meeting, Hotel Traymore, Atlantic City, N. J. Secretary, University.

**June 24-27.**—INTERNATIONAL ASSOCIATION OF FIRE ENGINEERS. Annual convention, Kansas City, Mo. Secretary, Gen. Fire Marshal James McFall, Emergency Fleet Corporation, U. S. Shipping Board, Philadelphia, Pa.

**Nov. 12-14.**—AMERICAN SOCIETY FOR MUNICIPAL IMPROVEMENTS. Annual convention, New Orleans, La. Secretary, Charles C. Brown, Bloomington, Ill.

### American Water Works Association.

The preliminary program for the coming convention of the American Water Works Association, which is to be held June 9-13 in Buffalo, N. Y., has been issued by secretary John M. Diven.

On Monday, following registration during the day, there will be a dance and reception in the evening. The address of welcome will be delivered by city commissioner Kreinheder.

Round table discussions will occupy the morning and afternoon sessions on Tuesday. The subjects will be "The Breaking of Fire Hydrants by Motor Trucks," "Billing and Collecting," "Reading of Meters" and "Handling of Meter Readings." It is expected to have ten men prepare short papers on these subjects, to be followed by discussion limited to five minutes per member.

On Tuesday evening will be presented illustrated papers on Buffalo's water works: "Buffalo's Water Supply, with Special Reference to Filtration Problems" and "Reduction of Water

Consumption by Means of Survey and Constant Inspection." There will be a theatre party for the ladies.

The business session will come on Wednesday morning, when officers will be elected and reports of officers and committees presented.

Wednesday afternoon will be devoted to an automobile trip through Buffalo, with a visit to the pumping station, and a golf tournament. There will be a smoker Wednesday evening, with a card party for the ladies.

Three or four special papers will be presented Thursday morning. In the afternoon there will be a trip to Niagara Falls, with dinner there. Friday will be left for unfinished business.

### Engineers of New York.

A very interesting meeting was held recently in New York at the Engineering Societies Building which resulted in a number of strong proposals looking to the desirability of a combination or a consolidation of engineering societies, both national and local.

Members in the New York metropolitan district from eighteen societies were invited. The meeting was arranged by the local sections of the American Institute of Mining and Metallurgical Engineers, the American Society of Mechanical Engineers and

the Society of Automotive Engineers. Most of the other societies participating have no special local organization.

The general subject discussed was "The Engineer as Citizen" and Gano Dunn, of J. G. White Co., presided. "The Civic Responsibility of the Engineer" was discussed by Philip N. Moore, consulting engineer, St. Louis; "The Relation of the Engineer to Legislation" by Calvert Townley, Westinghouse Electric Mfg. Co.; "The Relation of the Engineer to Administration" by Nelson P. Lewis, chief engineer of the Board of Estimate and Apportionment, New York City; "The Relation of the Engineer to Public Opinion," by Spencer Miller, Lidgerwood Mfg. Co., New York; "The Relation of the Engineer to Production and Distribution," by Prof. Comfort A. Adams, dean of Harvard Engineering School and chairman of the American Standards Committee.

Daniel L. Turner, chief engineer of the New York Public Service Commission, in discussing professional organization, urged the support of the American Association of Engineers as the unifying medium in civic activity.

Jesse M. Smith, consulting engineer, New York, described how the United Engineering Society, the holding organization for the founder engineering societies operating the Engineering Societies Building, provided the ma-

(Continued on page 269)

## PROBLEMS CITIES ARE STUDYING WITH EXPERTS

The Dalles, Ore., will let contract to build reinforced concrete VIADUCT according to plans prepared by the consulting engineer, T. A. Garrow.

WATERWORKS IMPROVEMENTS, for which \$1,000,000 bonds will be voted, are to be made by Bay City, Mich., according to plans prepared by the consulting engineers, Burns & McDonnell.

The board of commissioners of Graighead County, Jonesboro, Ark., will soon let a contract for ROAD IMPROVEMENTS involving paving with macadam and treating with bituminous surfacing 24.7 miles of road. The consulting engineers are Klyce & Kackley.

Wauseon, O., plans an election to vote on \$170,000 bonds for WATERWORKS IMPROVEMENTS, including an 80,000,000-gallon capacity impounding reservoir and filtration plant. The consulting engineer is W. J. Sherman.

SEWERAGE and PAVING IMPROVEMENTS and other engineering work are to be made by the city of Ranger, Tex., to cost about \$750,000. Plans are being prepared by the consulting engineers, Henry E. Elrod Co.

Saskatoon, Sask., is to make SEWERAGE IMPROVEMENTS according to plans prepared by the consulting engineering firm of Murphy & Underwood.

ROAD IMPROVEMENTS are to be made by Whitfield County, Dalton, Ga., at an estimated cost of \$80,000. The consulting engineers are the firm of Johnson & Morgan.

Inglewood, Cal., will soon vote on \$217,000 bonds to build a WATERWORKS SYSTEM, including wells, pumps, stand pipe, reservoir and distributing system, or purchase and improvement of the existing system. The consulting engineers are Olmsted & Gillelen.

Poinsett County, Harrisburg, Ark., has advertised for bids for ROAD IMPROVEMENTS on 16.38 miles of road according to plans prepared by the consulting engineers, W. R. Heagler & Sons.

Mt. Vernon, Ga., has advertised for bids for the construction of a reinforced concrete BRIDGE, plans for which were prepared by the consulting engineering firm of Garrett & Slack.



## INDUSTRIAL NEWS

**Iron and Steel Situation.**—The efforts of the Federal government to encourage construction by starting with an agreed lower price on steel and iron were nullified when Director-General Hines of the Railroad Administration refused to accept the new prices. He said that the implied arrangement that the government departments begin buying at the new prices did not bind him and that he could get lower ones. The price arrangement had the backing of the Industrial Board, the various departments and cabinet members and was presumably approved by President Wilson. Attempts to arrive at some satisfactory agreement are being made. Meanwhile the prices stand as the accepted quotations of the industry.

Business as a whole does not seem very much inclined to rush into buying at the new prices.

Pig iron manufacturers from every part of America held a meeting at the William Penn Hotel, Pittsburgh, to consider the new prices for pig iron suggested by the general committee of the American Iron and Steel Institute at its meeting with the Industrial Board of the Department of Commerce.

There was some discussion on the validity of existing contracts and whether there was any understanding that the newly appointed Industrial Board of the Department of Commerce was to be regarded as having any price-fixing powers or to exercise any authority in that direction.

While the organization was in session Edward F. Goltra, St. Louis, was appointed a committee of one to discuss this point, on the telephone, if possible, with the board at Washington, with the result that W. M. Ritter, vice-chairman of the board in Washington, authorized the following statement:

The Industrial Board of the Department of Commerce has repeatedly stated that it was not a price-fixing body in any sense of that phrase and any prices recognized by it are not to be taken as 'Governmental fixed prices.' The object that the board has in mind is to urge all the Government departments to resume purchases at the prices which the board deems fair, after acquainting itself thoroughly with all the conditions and facts as to production costs in order to effect stability and stimulate trade to the end that business and industry can proceed and build up with confidence, as well as provide maximum employment of labor.

Following this statement from the board, a resolution was adopted that the approval of the board given to the prices for iron and steel suggested by the committee of the American Iron and Steel Institute does not in any manner affect or reduce the prices or obligations fixed by contracts made prior to March 20; nor are the prices announced at or as a result of the meeting with the Industrial Board to be construed as affecting contracts in existence before that date.

**Wallace & Tiernan Co., Inc.,** New York, N. Y., has announced the return to its technical staff of Captain C. A. Jennings, who has received his discharge from the Construction Division, Utilities Branch, U. S. A. He was engaged in the supervision, operation and maintenance of water purification and sewage treatment plants in various camps. He will now resume charge of the company's Chicago office.

**The Dayton-Dowd Company,** Quincy, Ill., manufacturers of centrifugal and underwriters' fire pumps, announces the appointment of Mr. E. E. Maher as member of the Chicago branch, with offices at 30 N. Michigan boulevard. Mr. Maher is widely known as a sales engineer, having formerly been western manager of the Lea-Courtenay Co., and more recently district manager for the Terry Steam Turbine Co.

**Material Handling Manufacturers' Association,** which was recently organized, has appointed Zenas W. Carter secretary and manager. Mr. Carter was formerly commissioner of the Associated Metal Lath Manufacturers and before that was secretary of the Granite Paving Block Manufacturers' Association. The new association has opened offices at 35 West 39th street, New York City.

The board of governors chose the following officers: President, Calvin Tompkins, former dock commissioner of New York; vice-president, James A. Shepard, Shepard Electric Crane & Hoist Co., Montour Falls, N. Y.; treasurer, Lucien C. Brown, Elwell-Parker Electric Co., Cleveland; acting secretary, Fred Stadelman, Wellman-Seaver-Morgan Co., New York.

## NEWS OF THE SOCIETIES

(Continued from page 268)

chinery for the proposed general engineering organization, while Mr. Moore called attention to the position being attained by the engineer in the likely early establishment of a national department of public works, under which can be correlated the different engineering functions of the United States which are now scattered under twenty-two bureaus and six cabinet officers. The engineering societies of the country, he added, have been requested to send delegates to a meeting in Chicago, April 23, 24 and 25, to discuss the plan.

The resolutions adopted were summarized as follows:

That the different local memberships appoint a delegate to attend a joint conference with a view to organizing to obtain closer co-operation among engineers whereby they may become more potent in fulfilling their responsibilities as citizens.

That societies not now having committees on development be asked to appoint such committees to make a survey of the aims and purposes of their organizations and to co-operate with the existing committees.

That the representatives of the various societies participating in the meet-

ing recommend to their organizations that a delegate be appointed to a common engineering conference to discuss, formulate and report back to their respective bodies a code for professional conduct with a view to its adoption by all of the engineering bodies involved as a common code for the engineering profession.

## American Society of Civil Engineers.

The annual convention of the American Society of Civil Engineers will be held this year in St. Paul-Minneapolis June 17-20, according to a decision by the Board of Direction. The last June convention was held in Pittsburgh in 1916, the St. Paul-Minneapolis meeting scheduled for June 12-15, 1917, having been indefinitely postponed on account of war conditions.

The committee of the board in charge of arrangements consists of W. L. Darling, E. E. Wall and Charles Warren Hunt.

## PERSONALS

Ash, Lewis R., has handed in his resignation as city manager of Wichita, Kans.

Montgomery, Major H. M., has been discharged from the service and has accepted the appointment of commissioner of public works and city engineer of Evanston, Ill.

Shoemaker, Geo. E., has been appointed general manager and secretary of the waterworks of Waterloo, Ia. He had been secretary for the past nine years.

Skidmore, H. W., construction engineer, department of public works, village of Oak Park, Ill., will become associated with Lester Kirschbraun, consulting and testing engineer of Chicago, and will become associate director of the Chicago Paving Laboratory, devoting practically all of his time to the paving field.

The following mayors have been elected in Iowa: Algona, W. E. McDonald; Anamosa, C. A. Beems; Atlantic, Joseph Burnea; Cedar Falls, William Morgan; Centerville, W. S. Fox, re-elected; Eagle Grove, J. T. Fort; Estherville, B. B. Anderson; Fort Dodge, A. O. Scott; Grimes, H. F. Peitman; Hampton, J. C. Powers; Iowa City, Ingalls Swisher; Jefferson, E. J. Forbes; Lemars, G. E. Ellers; Marshalltown, J. J. Wilson defeated F. G. Pierce; Mason City, N. C. Kitchell; McGregor, J. W. Boyle; Mooreland, W. E. Dickerson; Mount Pleasant, J. H. Mills; Red Oak, C. E. Owens; Newton, F. L. Maytag; Oelwein, J. F. Jepson; Oskaloosa, Al Mendenhall; Shenandoah, F. M. Hockett; Storm Lake, S. F. Lumann; Tama, T. Hixon; Vinton Philip Howe; Winterset, Wood Wilson; Weldon, J. F. Stevens; What Cheer, J. A. Cowan, re-elected.

## THE MUNICIPAL INDEX

In Which Are Listed and Classified by Subjects All Articles Treating of Municipal Topics Which Have Appeared During the Past Month in the Leading Periodicals.

It is our purpose to give in the second issue of each month a list of all articles or any length or importance which have appeared in all the American periodicals and the leading ones published in other countries, dealing more or less directly with municipal matters. The Index is kept up to date, and the month of literature covered each time will be brought up to within two or three days of publication. Our chief object in this is to keep our readers in touch with all the current literature on municipal matters. In furtherance of this we will furnish any of the articles listed 'n the index for the price named after each article, except that where an article is continued in two or three issues of the paper, the price given is for each of said issues. In addition to the titles where these are not sufficiently descriptive or where the article is of sumcient importance, a brief statement of its contents is added. The length also is given, and the name of the author when it is a contributed article.

### ROADS AND STREETS.

#### Designing and Theory:

Recent Developments in Design and Construction of Pavements in Chicago. During 1918 several changes in pavement design were adopted and successfully realized in practice. By H. J. Fixmer, paving engr., Board of Local Improvement, Chicago. 2 ills., 1,600 words. Municipal and County Engineering, March. 25 cts.

Reconstruction of Narrow Roadways of Trunk Highways. Width, drainage, foundations, pavement surfaces, desirability of maintaining traffic during construction, economic improvement of line and grade. Committee report presented at the convention of the American Road Builders' Assn. 600 words. Good Roads, Mar. 22. 10 cts.

Road Foundations, Drainage and Culverts. Careful attention should be given in highway construction to foundation and drainage of roadway to provide firm and uniform support to the surfacing materials; construction and location of culverts. By George Hogarth, chief engr., Ontario Highways Dept. 6 ills., 1,500 words. Canadian Engineer, Mar. 6. 15 cts.

Wider Pavements Needed by Motor Vehicles at Curves. Theoretical width determined by formula; chart of necessary and recommended widths plotted for various radii. By G. S. Eaton, ass't division engr., Universal Portland Cement Co. 3 ills., 1,100 words. Engineering News-Record, Mar. 6. 20 cts.

Highway Foundation Requirements. If the highways must carry additional loads, engineers must give more attention to their foundations. 2,200 words. Engineering World, Mar. 1. 15 cts.

Some Lessons from French Roads. Macadam roads as built in France more expensive than ours, but could not withstand our traffic; will probably fail there soon. By E. A. Kingsley, maj. of engrs., A. E. F., Nevers, France. 2,000 words. Municipal Journal, Mar. 1. 10 cts.

The Relation of Street Systems to Highways Outside of Urban District. Need of suitable connections between the primary street systems of a city and the chief highways traversing its immediate surroundings. Abstract from a paper presented at the convention of the American Road Builders' Assn. by Nelson P. Lewis, chief engr., Board of Estimate and Apportionment, N. Y. C. 1,400 words. Engineering and Contracting, Mar. 5. 15 cts. 2,300 words. Canadian Engineer, Mar. 20. 15 cts. 2,200 words. Good Roads, Mar. 1. 10 cts.

High Relative Temperatures of Pavement Surfaces. Thermometer readings taken on surfacings and on the adjacent lawns show a variation of from 9 to 22 degrees. By G. S. Eaton, ass't division engr., Universal Portland Cement Co., Chicago. 3 ills., 700 words. Engineering News-Record, Mar. 27. 20 cts.

The Correlation of Highway and Waterway Transport. Authority must be vested in one body with competent jurisdiction to pass authoritatively on all subjects pertaining to transport matters. Paper before the convention of the National Rivers and Harbors Congress, Washington. By Peter G. Ten Eyck, regional director, Highways Transport Committee. 1,900 words. Good Roads, Mar. 15. 10 cts.

The Relation of Highways to Railways and Waterways. Past enmity and opposition on the part of rail and water carriers to the development of highway transportation changed in the last 18 months. By Geo. H. Pride, pres., Heavy Haulage Co., N. Y. Paper before the convention of the American Road Builders' Assn. 800 words. Engineering and Contracting, Mar. 5. 15 cts. 1,400 words. Good Roads, Mar. 22. 10 cts.

#### Finances:

Suggested Methods of Financing Pavement Maintenance. The need for new legislation for adequate financing of pavement maintenance in Illinois cities pointed out by F. C. Lohman, city engr., of Champaign, in a paper at the recent meeting of the Illinois Society of Engineers. 800 words. Engineering and Contracting, Mar. 5. 15 cts.

Huge Sum to Be Spent for Highways. National government and state will expend \$574,000,000 in next three years for federal aid work, while total state and local work in 1919 is estimated at \$385,000,000. 1 table, 1,000 words. Good Roads, Mar. 8. 10 cts.

Bill Appropriates \$209,000,000 for Federal Aid. Text of portions of the annual post office appropriation bill making provisions for large increase in government road funds and amending the federal aid road act of 1916. 1,000 words. Good Roads, Mar. 15. 10 cts.

Efficient Methods of Promoting Highway Bond Issues. Author describes the Illinois plan, which he considers efficient, equitable and thoroughly practicable for states whose conditions are similar. By S. E. Bradt, state supt. of highways of Illinois, paper before the convention of the American Road Builders' Assn. 1,600 words. Good Roads, Mar. 29. 10 cts.

#### Guarantees:

Guarantees for Paving. Opinions of several city engineers as to their desirability; duration of guarantee; for what kinds of pavement desirable. 1,800 words. Municipal Journal, Mar. 15. 10 cts.

Pavement Guarantees. Report of Committee on "Economic Status of Guarantees of Pavements on Roads and Streets," presented at the annual convention of the American Road Builders' Assn. 2,500 words. Canadian Engineer, Mar. 27. 15 cts.

Pavement Guarantees. Uniform length of guarantee for all pavements or for the same pavement under varying traffic conditions is neither logical nor justifiable. From a committee report submitted at the convention of the American Road Builders' Assn. 1,000 words. Engineering and Contracting, Mar. 5. 15 cts. 2,800 words. Municipal Journal, Mar. 8. 10 cts.

Pavement Guarantees. Editorial discussion of the report of the committee on "Economic Status of Guarantees for Pavements, on Roads and Streets," which is published in this issue. 700 words. Municipal Journal, Mar. 8. 10 cts.

The Question of Guarantees. Editorial discussion of the principle on which requiring of guarantees for pavement should be founded and desirability of requiring guarantees at all. 1,700 words. Municipal Journal, Mar. 15. 15 cts.

#### Contracting:

Methods of Contracting for Highway Work During the Reconstruction Period. Brief outline of methods of contracting that have heretofore prevailed; no method that will apparently offer an improvement upon lump sum bid form of contract. By John H. Gordon, pres., N. Y. State Road Builders' Assn., from paper at convention of the American Road Builders' Assn. 1,200 words. Engineering and Contracting, Mar. 5. 15 cts. 1,400 words. Municipal and County Engineering, March. 25 cts.

Competency of Contractor Deciding Factor in Awarding Highway Contracts. Must take into consideration something besides the low bid. By S. E. Fitch, division engr., N. Y. State Commission of Highways. 1,600 words. Engineering and Contracting, Mar. 5. 15 cts.

Letting Road Contracts in Long Stretches. Best interests of the public would often be served thereby. 1,200

words. Engineering News-Record, Mar. 15. 20 cts.

Cost Keeping for Highway Contractors. Suggestions for making daily estimates of unit costs; lost time; daily overhead; installing and shifting plant. Paper before the American Road Builders' Assn., by H. P. Gillette. Municipal Journal and Public Works, Mar. 29. 10 cts. 2,700 words. Engineering and Contracting, Mar. 5. 15 cts. 2,700 words. Canadian Engineer, Mar. 6. 15 cts.

#### Construction:

Road Grading with Blade Grader-Tractor Outfit. Excellent results obtained last year by Wisconsin counties by using a 10-ft. blade grader hauled by a 30 or more h.p. tractor, supplemented with small crew of wheel scrapers. 2 ills., 900 words. Engineering and Contracting, Mar. 5. 15 cts.

Ditch and Road Work Combined on Drainage Project. Spoil from dragline and wheel excavators builds roads; engineer uses tractor plows to break surface mat. 2 ills., 700 words. Engineering News-Record, Mar. 27. 20 cts.

Breaking Up Concrete Pavement with Dynamite. Method of blasting employed in tearing down an old suspension bridge in Warren, Pa. 300 words. Municipal Journal, Mar. 8. 10 cts.

Stone and Gravel Road Construction. Method of construction; selection of stone; loading at the pit. Paper before the meeting of the Ontario Good Roads Assn., by J. G. Wilson, county road supt., Halton county, Ont. 1,400 words. Canadian Engineer, Mar. 20. 15 cts.

Freight Rates on Sand and Gravel. Representatives of the National Association of Sand and Gravel Producers endeavored to persuade the Railroad Administration to reduce rates. 200 words. Municipal Journal, Mar. 1. 10 cts.

#### Maintenance:

Methods of Maintaining Highway Systems Prior to Construction by State or County. Brief outline of what a few states are doing in the way of maintenance of unimproved, designated highway systems. By F. E. Everett, state highway commissioner of New Hampshire, paper before the convention of the American Road Builders' Assn. 2,200 words. Good Roads, Mar. 29. 10 cts.

Results and Lessons from First Year of State Highway Maintenance in Wisconsin. State Highway Commission began in 1918 maintaining 5,000 miles of state truck highway by patrol system, supplemented in most counties by gang maintenance. From the report of the Commission, by J. T. Donaghey, maintenance engr. 1,400 words. Engineering and Contracting, Mar. 5. 15 cts.

Road Maintenance. Repairs should be prompt, systematic and continuous; new conditions almost daily. Paper before the meeting of the Ontario Good Roads Assn., by F. A. Senecal, county road supt., Prescott and Russell counties, Ont. 1,500 words. Canadian Engineer, Mar. 20. 15 cts.

Repairing Pavement Openings. Practices of several hundred cities as to methods of restoring pavements; by city employees or by parties making opening; charges by cities for making repairs; minimizing number of pavement cuts. 2 ills., 3,600 words. Municipal Journal, Mar. 22. 10 cts.

Cannot Cut Pavement Within 5 Years. Signs posted in Cleveland, O., giving warning requiring all underground connections to be placed before paving is done. 1 ill., 500 words. Engineering World, Mar. 15. 15 cts. 1 ill., 300 words. Municipal and County Engineering, March, 25 cts.



No openings in Pennsylvania State Roads. Lewis S. Sadler, highway commissioner, announces that no pavement will be put down by the state highway department until every pipe or sewer connection is made on thoroughfare in question. 200 words. Municipal Journal, Mar. 22. 10 cts.

#### Labor:

**Labor Conditions in the United States.** Information and opinions collected from state highway departments, cities, contractors, and the Department of Labor; emigration of laborers. From a report by Paul D. Sargent, chief engr. of the Main State Highway Commission, to the convention of the American Road Builders' Ass'n. 1,000 words. Municipal Journal, Mar. 15. 1,900 words. Municipal Journal, Mar. 22. 10 cts.

**Probable Wages and Supply of Construction Labor During Coming Season.** Summaries of replies from state highway departments, cities, contractors, and information from U. S. Department of Labor. Report of committee at the convention of the American Road Builders' Ass'n, by Paul D. Sargent, chairman. 2,500 words. Engineering and Contracting, Mar. 19. 15 cts. 3,000 words. Good Roads, Mar. 8. 10 cts.

**Labor Available for Road Work.** Brief discussion of the report at the convention of the American Road Builders' Association by Paul D. Sargent, which will be published in our next week's issue. 400 words. Municipal Journal, Mar. 1. 10 cts.

#### Administration:

**National Highway Commission.** For administration of a national highway system, is advocated by the committee of the American Road Builders' Ass'n. 2,100 words. Canadian Engineer, Mar. 13. 15 cts.

**The County Highway Engineer-Manager.** 31 counties in Michigan now employ county engineers on a salary; advantages of the plan. By E. E. Sours, engr., Big Rapids, Mich. 1,700 words. Municipal and County Engineering, March. 25 cts.

**Operations of the Bureau of Public Roads under the Federal Aid Road Act.** Underlying principle of the whole federal measure is co-operation. Paper presented at the convention of the American Road Builders' Ass'n, by P. St. J. Wilson, chief engr. and acting director, Bureau of Public Roads, U. S. Dept. of Agriculture. 2,400 words. Good Roads, Mar. 1. 10 cts.

#### Convention of A. R. B. A.

**After-War and Motor-Truck Problems Hold Attention of Road Builders.** Abstracts from the following papers presented at the meeting of the American Road Builders' Ass'n: Efficiency of Bituminous Surfaces under Motor-Truck Traffic, by Prevost Hubbard, chem. engr., U. S. Bureau of Public Roads. State, City and County Road Systems Should Be a Unit, by Nelson P. Lewis, chief engr., Board of Estimate and Apportionment, N. Y. S. Sources of Supply of Unskilled Labor for Highway Work, committee report by Chairman Paul D. Sargent, chief engr., Maine State Highway Commission. Vitriified Brick Traffic, by Maj. W. M. Acheson, division engr., N. Y. State Highway Dept. 5,500 words. Engineering News-Record, Mar. 6. 20 cts. 2,200 words. Good Roads, Mar. 1. 1 ill., 3,000 words. Good Roads, Mar. 8. 10 cts.

**The Tenth National Good Roads Show under the Auspices of the A. R. B. A.** Brief description of the displays in the exhibition of road machinery and materials at the 16th annual convention of the American Road Builders' Ass'n. 2 ill., 2,500 words. Good Roads, Mar. 8. 10 cts.

**The Convention.** Editorial comment and appraisal of the sixteenth annual convention of the American Road Builders' Association, New York, February 25-28, 1919. 700 words. Good Roads, March 1. 10 cts.

#### Bituminous Pavements:

**Efficiency of Bituminous Surfaces and Pavements Under Motor-Truck Traffic.** Situation in 1918; outstanding features of road failures under heavy motor-truck traffic; bituminous surfaces as temporary method of preserving macadam road. By Prevost Hubbard, chemical engr., U. S. Bureau of Public Roads. Paper presented at the convention of the American Road Builders' Association. 2,800 words. Engineering and Contracting, March 5. 15 cts. 3,000 words. Municipal and County Engineering, March. 25 cts. 2,800 words. Canadian Engineer, March 6. 15 cts.

2,800 words. Good Roads, March 15. 10 cts.

**Smooth, Dustless Roads Maintained by Gang System.** Bituminous carpet placed on macadam highways in Michigan fruit district; slag has proved satisfactory for the metal of these roads. 3 ill., 2,300 words. Engineering News-Record, March 13. 20 cts.

#### Macadam:

**Conclusions of Wisconsin Highway Commission on Surface Treatment of Macadam.** From experiments conducted in the summer of 1917 by the Wisconsin Highway Commission; abstract of the report of the commission. 1,100 words. Engineering and Contracting, March 5. 15 cts.

**The Reconstruction of Worn-Out Macadam Upon a State Road in Rhode Island.** Surface treatment of stone-fill foundations; correcting old foundation defects; bituminous macadam wearing surface. By I. W. Patterson, chief engr., state board of public roads, Providence. 1 ill., 3,400 words. Municipal and County Engineering, March. 25 cts.

**Macadam Road Built by Red Cross Refugees in China.** Granite slabs of old road used for edging; type of camp built; macadam stone broken by hand. By R. R. White, Peking, China. 6 ill., 1,200 words. Engineering News-Record, March 6. 20 cts.

**Method Employed in Resurfacing Old Macadam Streets in Madison, Wis.** Entire surface is scarified to depth of 3 inches, then graded with street grader and rolled down with steam roller. By George Sullivan, supt. of streets, Madison. 700 words. Municipal and County Engineering, March. 25 cts.

**Building New Concrete Shoulders to Preserve the Old Macadam Roads of Maryland.** Procedure in construction; advantage of central mixing plant. By John N. Mackall, chief engr., Maryland State Roads Commission, Baltimore. 3 ill., 1,200 words. Municipal and County Engineering, March. 25 cts.

#### Brick:

**Present Status of Brick Pavements Constructed with Sand Cushions, Cement Mortar Beds and Green Concrete Foundation.** By Major William M. Acheson, state highway department, Syracuse, N. Y. 2,500 words. Municipal and County Engineering, March. 25 cts.

**Rigid Paving Inspection Needed to Cure the "Poor Grouting" Evil.** Giving views illustrating sequence of operations in recommended method of grouting a semi-monoolithic brick road. By H. H. Edwards, highway engr., University of Illinois, Urbana. 8 ill., 300 words. Municipal and County Engineering, March. 25 cts.

#### Other Types:

**Some Points to Observe in the Construction of Concrete Roads.** Adequate drainage; preparation of sub-grade; coarse and fine aggregate; mixing and placing concrete. By William W. Cox, deputy state highway commissioner, Lansing, Mich. 2,000 words. Municipal and County Engineering, March. 25 cts.

**Salt-Marsh Sand-Clay as a Road-Building Material.** Abounds in tidal lands in Texas; primarily a mixture of Epsom salts, gypsum, clay and sand; economical to use. 1,200 words. Engineering News-Record, March 20. 20 cts.

**Results of Wisconsin Experiment in Covering Sand Roads with Hay-Tar Mat.** In October, 1917, the Wisconsin Highway Commission constructed an experimental highway for the purpose of determining the advantages of this method; results summarized in recently issued biennial report. 700 words. Engineering and Contracting, March 5. 15 cts.

**Some Suggestions on the Proper Construction of Granite Block Pavements.** Procedures in northern and southern quarries; modern adaptations of the material; use of bituminous mastic filler. By A. T. Rhodes, field engr., Paving Block Manufacturers' Association of the U. S., Boston, Mass. 7 ill., 3,500 words. Municipal and County Engineering, March. 25 cts.

#### State Highway Work:

**Connecticut Highway Work.** Report of State Highway Commissioner Bennett reviews operations of highway department in 1917-18. 900 words. Good Roads, March 1. 10 cts.

**Two Types of Hard Surface Roads Successfully Employed in New Hampshire.** Asphaltic concrete pavement used on two large federal aid roads; concrete roads. By F. E. Everett, state highway commissioner, Concord. 1,300 words. Municipal and County Engineering, March. 25 cts.

**Some Features of Highway Work in Kansas.** Benefit districts; federal aid roads and allotments; much road work coming. By M. W. Watson, acting state highway engr., Topeka, Kan. 3 ill., 1,700 words. Municipal and County Engineering, March. 25 cts.

**Minnesota's Proposed Trunk Highway System.** Recommendations will be submitted by commissioner of highways for building a trunk highway system approximately 6,000 miles in extent, penetrating into every part of state. 1,700 words. Engineering World, March 15. 15 cts.

**Code Letters as Highway Reports.** Description of letter received from Texas State Highway Engineer George A. Duren for giving in condensed space information concerning status of each highway job at date of report. 500 words. Municipal Journal and Public Works, March 29. 10 cts.

**Roads in Coleman Township.** Haste and erratic development; excavation provides thrills; profitable retaining walls; excellent—in wet weather. By H. T. Routly, construction engr., Ontario Highways Department. Paper before the meeting of the Association of Ontario Land Surveyors. 4 ill., 2,800 words. Canadian Engineer, March 6. 15 cts.

**Road Building in 1919.** What the Federal Government proposes; important suggestions as to construction and drainage. 2,000 words. The Modern City, March. 40 cts.

#### Miscellaneous:

**Suggestions for Inspectors on County Road and Bridge Construction.** Simple test of clay and silt in fine aggregate; test for organic impurities in sand; curing concrete. Useful suggestions given by C. R. Weymouth, acting division engr. of the Wisconsin Highway Commission. 1,500 words. Engineering and Contracting, March 5. 15 cts.

**Design and Constructional Features of the Baraga Road in Baraga County, Mich.** Road divided into four sections, and contracts awarded in April, 1918; complete length of road, 48.2 miles. By G. C. Dillman, district engr., State Highway Department, Escanaba, Mich. 2 ill., 2,400 words. Municipal and County Engineering, March. 25 cts.

**Detroit Plans Comprehensive Scheme for Grade Crossing Removal.** City engineers study problem as a whole, and recommend program for next fifteen years; prepare standards of design and study city planning, freight yards and industry tracks. 3 ill., 2,800 words. Engineering News-Record, March 13. 20 cts.

**Canada's Road-Building Era.** Joint jurisdiction in future; highways as feeders; government grants equalize cost. Informal speech delivered at meeting of the Ontario Good Roads Association by A. W. Campbell, dominion highways commissioner. 1,000 words. Canadian Engineer, March 20. 15 cts.

**Paving Statistics of Cities.** Concluded from last week's issue. 1,200 words. Municipal Journal, March 1. 10 cts.

**Roadside Planting as a Memorial to Our Soldiers and Sailors.** Many elements of importance that should be given consideration; tree planting, if properly done, of great practical value aside from that of ornamentation; affords protection by means of shade to pavement in summer. By Professor R. B. Faxon, in the American Forestry. 7 ill., 2,400 words. The Modern City, March. 40 cts.

**Roads Rule the World.** Active and progressive program of road building anticipated this year; roads must be classified according to traffic; basic principle of apportionment. Presidential address delivered at the meeting of the Ontario Good Roads Association by C. R. Wheelock, Orangeville, Ontario. 1,600 words. Canadian Engineer, March 20. 15 cts.

**Uniform Highway Signs.** Already adopted by five states; modifications of Connecticut and New Jersey signs recommended for country-wide adoption. 2 ill., 500 words. Municipal Journal and Public Works, March 29. 10 cts.

## SEWERAGE AND SANITATION.

#### Sewage Treatment:

**Sewage Disposal Works at London, Ontario.** Two-story, non-reversible sedimentation tanks and enclosed filters with fixed spraying nozzles; history of London's sewerage problems since 1891; construction of interceptors and outfalls; review of work done and suggestions for further improvements. By Willis Chip-

man, of Chipman & Power, consulting engr., Toronto. 12 ills., 4,500 words. Canadian Engineer, March 6. 15 cts.

New York Sewage Screening Plant. A few corrections in the article published in our February 18 issue on the Dyckman street plant. 100 words. Municipal Journal, March 1. 10 cts.

Sprinkling Filter Flies. Drowned by flooding filter beds for twenty-four hours; satisfactory experience with this method at Plainfield, N. J. 1,000 words. Municipal Journal, March 8. 10 cts.

Control of Sewage Filter Fly by Flooding Filter Bed. Drowning proved an effective measure to kill the myriads of small, moth-like flies in sewage sprinkling filters at Plainfield, N. J. 500 words. Engineering and Contracting, March 12. 15 cts.

Sewerage of Leominster, Mass. Treatment in tanks, with some novel features, followed by sprinkling filters; one of four units designed for city of 20,000 population; no sludge after ten months' operation. 3 ills., 1,600 words. Municipal Journal and Public Works, March 23. 10 cts.

Obtaining Sewage for Experiment Stations. Removing it from sewer by bucket elevator so as to secure characteristic suspended matter content; removing grit. 1,700 words. Municipal Journal and Public Works, March 29. 10 cts.

#### Sewers:

Concrete Sewer - Pipe Specifications Adopted by Los Angeles. Draft of 1919 provides for one-to-three mix; dimension variations fixed; imperfections that will cause rejections. 2 tables, 800 words. Engineering News-Record, March 13. 20 cts.

Binghamton Sand Catcher. Tried out successfully for preventing deposits in sewers with flat grade and poorly designed; adopted as standard. By W. Earl Weller, city engr. of Binghamton, N. Y. 1 ill., 800 words. Municipal Journal, March 8. 10 cts.

San Francisco Settling Chamber. Special feature is a central wall that divides the settling basin in two equal channels to facilitate removal of deposited matter. 1 ill., 200 words. Municipal Journal, March 8. 10 cts.

#### Sanitation:

Texas Board of Health Report. Annual report of Bureau of Sanitary Engineering of the State Board of Health records a most commendable activity along the line of sewage treatment, water purification, refuse disposal, etc. 500 words. Municipal Journal, March 22. 10 cts.

Legislation to Prevent Pollution. Of boundary waters and of waters crossing the boundary will be framed by the International Joint Commission. 1,600 words. Canadian Engineer, March 13. 15 cts.

Mosquito Control in Ponds by Means of Fishes. Results of an investigation by Samuel F. Hildebrand of the effectiveness of fishes as eradicators of the aquatic stages of the mosquito, and conduct of such operations as would promise secure "fish control" where control by oiling was impossible. Extracts from Mr. Hildebrand's report to the U. S. Commissioner of Fisheries. 1,600 words. Engineering and Contracting, March 12. 15 cts.

The Insect Problem in Cities. An excellent practice would be to employ a consulting entomologist in all large cities; requirements of municipal sanitation. By W. Dwight Pierce, Ph.D., Bureau of Entomology, U. S. Department of Agriculture. 2 ills., 1,000 words. American City, March. 35 cts.

Sanitary Service Rids Construction Camp of Influenza. Strict enforcement of ordinary sanitary precautions kept intact working force on Camp Custer extension when surrounding communities were decimated by disease. By M. D. Kauffman, division engr. in charge of sanitation, Camp Custer Extension. 7 ills., 1,800 words. Engineering News-Record, March 27. 20 cts.

Health Board Studies Pipe Corrosion in Buildings. Cast-iron vents have long life, but increasers required at roof cause rusting from stoppages; wrought iron preferable to steel. 6 ills., 1,700 words. Engineering News-Record, March 6. 20 cts.

The "Smoke Nuisance" and How It Can Be Eliminated by Civil Engineers. Air of every city can be made pure by being kept pure; street sweeping and flushing under direction of engineers, not politicians; central heating plants. 800 words. Engineering and Contracting, March 12. 15 cts.

## WATER SUPPLY.

### Dams:

Conditions of Stability and Suggested Design for Wooden Dam Built on Sand. Most important condition to prevent flow of water through the body of sand on which the dam rests and to protect against erosion the bed of the river immediately below. Abstracted from annual report of the Quebec Streams Commission by Arthur Surveyor, consulting engr., Montreal. 2,000 words. Engineering and Contracting, March 12. 15 cts.

Factors Requiring Special Consideration in Hydraulic Fill Dam Construction. From a paper presented before the San Francisco section of the American Society of Civil Engineers. By C. E. Grunsky. 1,600 words. Engineering and Contracting, March 12. 15 cts.

Auxiliary Outlet Gate Relieves Main Gates of Dam. Drillers on suspended platform cut opening in gate well to avoid operating main gates under high head. By R. C. E. Weber, assistant engr., U. S. Reclamation Service, Orland, Cal. 2 ills., 800 words. Engineering News-Record, March 27. 20 cts.

Recent Installations of Lang Gates. The Lang gate, a modified bear trap, has been recently in one instance as a gate for a sluice and in the other as a waste gate. Extracts from a description of these installations in a recent issue of the Michigan Technique by Donald C. May. 6 ills., 1,700 words. Engineering and Contracting, March 12. 15 cts.

Old-Fashioned Methods Reduce Cost of Dam Repairs. Contractor met local conditions and avoided expensive operations without interrupting city's water supply. By Charles F. Dingman, Association American Society Civil Engineers. 3 ills., 1,200 words. Engineering News-Record, March 13. 20 cts.

### Pumping:

Pumps and Accessories. Selection of equipment requires careful consideration, as there is no one best type for all conditions; pumping by compressed air. 1,500 words. Fire and Water Engineering, March 26. 15 cts.

Stokers at Philadelphia. All of the main pumping plants equipped with mechanical stokers, handling between four and five thousand tons of coal every twenty-four hours. 1 ill., 1,000 words. Fire and Water Engineering, March 26. 15 cts.

Electric and Steam Pumping Plants. Editorial discussion of the advantages and disadvantages of electric plants for water-works pumping, with reference to the Lancaster plant, described in this issue. 500 words. Municipal Journal, March 1. 10 cts.

Electrically Operated Deep-Well Pumps. Result of tests showing performance of crank type, motor operated pump for a wide range of speeds; pump of belt driven double action type. Excerpts of paper before the Illinois section A. W. W. A. by P. S. Biegler and I. W. Fisk. 3 tables, 1,400 words. Fire and Water Engineering, March 19. 15 cts.

Lancaster's Remodeled Pumping Plant. Changed from a steam to an electric plant; cost of operating plant reduced one-third; details of pumps, motors and other equipment; result of test of pumps. By John T. Brainerd, secy. water department, Lancaster, Pa. 4 ills., 2,300 words. Municipal Journal, March 1, 1919. 10 cts.

### Meters:

Water Consumption in Detroit. Maximum daily and hourly consumption; use and advantages of meters; computation of saving effected by such use. 2,200 words. Municipal Journal, March 22. 10 cts.

Meters and Accessories. The water meter a power for conservation; universal meterage not far off, and meantime more cities are adopting the system every day. 1,500 words. Fire and Water Engineering, March 26. 15 cts.

Detroit on Meterage. Superintendent George H. Fenkell presents strong argument for the system in his annual report, and backs it up with figures; great saving through use of meters; few consumers now object to them. 1,800 words. Fire and Water Engineering, March 5. 15 cts.

Meter Practices of the Hackensack Water Company. Testing meters; meter setting and reading; maintenance. By D. W. French, from a paper before the New York section of the American Waterworks Association. 1,400 words. Engineering and Contracting, March 12. 15 cts.

Compound Meters. Notes on their utility and performance; designed to obviate loss of registration on flows too small for measurement by full-line meter; improvements suggested. By Fred B. Nelson, C. E., Department of Water Supply, Gas and Electricity, New York City. 1,100 words. Fire and Water Engineering, March 5. 15 cts.

Methods of Waste Prevention. Various means employed to prevent loss in the pumping plant and the system of distribution. 1,200 words. Fire and Water Engineering, March 26. 15 cts.

### Rainfall and Run-Off.

New England Rivers Have Similar Run-Off Characteristics. In seven different rivers curves show half of total flow in three months and three-quarters in six months. 1 ill., 500 words. Engineering News-Record, March 20. 20 cts.

Use of Rainfall Records. Gauges should be established relatively short distances apart throughout the country; variation in rainfall rates of different areas; mass diagrams; evaporation and run-off. Paper before the New England Waterworks Ass'n, by L. M. Hastings, city engr., Cambridge, Mass. 4 ills., 2,300 words. Municipal Journal, Mar. 15. 10 cts. Engineering and Contracting, Mar. 12. 15 cts.

Snow Surveys of Water Sheds. Methods used by state department of engineering of California. 2 ills., 1,700 words. Municipal Journal and Public Works, Mar. 29. 10 cts.

### Purification:

Rotary Screens Remove Dirt from Water at St. Paul. Drums have shells built up of screen sections; wash water received by hopper is discharged through axle. 2 ills., 500 words. Engineering News-Record, Mar. 20. 20 cts.

Some Recent Filtration Plants. Purification of surface water rapidly coming to be the established practice the world over. By Chas. W. Lusk, C.E., Pittsburgh Filter Manufacturing Co. 4 ills., 1,600 words. Fire and Water Engineering, Mar. 26. 15 cts.

Result of Application of Chloramine Process to Catskill (Esopus) Water of New York City. Relation of temperature to chloramine efficiency; treatment of turbid water with chloramine. By Frank E. Hale, director of laboratories, Dept. Water Supply, Gas and Electricity, N. Y. C. 3 ills., 4 tables, 2,000 words. Engineering and Contracting, Mar. 12. 15 cts.

The Necessity of Filtration. Why cities and towns should filter their water; economic consideration apparently most difficult of comprehension; nation's heavy typhoid list. By F. E. Leopold. 1,000 words. Fire and Water Engineering, Mar. 26. 15 cts.

### Rates:

Engineer Arbitrators Fix Value of Water-Company Property. Time and money saved by engineers on ground after their representatives had made an inventory. By Farley Gannett, consulting engr., Harrisburg, Pa. 2,100 words. Engineering News-Record, Mar. 27. 20 cts.

The Unfairness of New York City in Its Relations with Water Companies. Peculiarly anomalous situation where city charter gives the municipal water commissioner the power to regulate the rates of water companies. 900 words. Engineering and Contracting, Mar. 12. 15 cts.

Daytona Sewers and Waterworks. Geo. A. Main, superintendent of water and sewerage department informs the commissioners that its low water rates have not been increased, in spite of higher cost of materials and labor. 400 words. Municipal Journal, Mar. 1. 10 cts.

### Maintenance:

Construction and Maintenance. Increase in use of labor-saving machines a feature; advantage of trenching and back-filling by machinery; other devices that are gaining favor. 3 ills., 1,300 words. Fire and Water Engineering, Mar. 26. 15 cts.

Waterworks Operation: Making Water Analyses. Information concerning nearly one hundred waterworks laboratories; locating laboratory; taking samples. 1,100 words. Municipal Journal, Mar. 1. 10 cts.

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Columbus Waterworks in 1918. Effect of war prices on department's finances; less softening chemicals used; costs and results of purification. 1,500 words. Municipal Journal, Mar. 22. 10 cts.



**The Hetch Hetchy Records.** Letter from the city engineer of San Francisco, M. M. O'Shaughnessy correcting certain data desired by the San Francisco Bureau of Governmental Research. 300 words. *Municipal Journal*, Mar. 15. 10 cts.

**Repairs to Risers in Tunnel Shafts.** How a break in a shaft of the Catskill aqueduct in New York City was repaired; two of the bronze riser valve pipes without strain without rupture; steel riser pipes welded by electric arc. Excerpts from paper before the New York Section of American Waterworks Ass'n, by J. Waldo Smith, chief engr., board of water supply, N. Y. C. 2,900 words. *Fire and Water Engineering*, Mar. 12. 15 cts.

**Cambridge Water Department.** Its history traced from small beginning as a water company; originally chartered in 1837, and became a municipal department in 1865 by purchase; a 20,000,000 gallon filtration plant under consideration. 2 ills., 1,000 words. *Fire and Water Engineering*, Mar. 12. 15 cts.

**Chicago Determines Capacity of Water Tunnel.** Three tests by salt solution method check closely. By F. A. Smith, C.E., Department of Public Works, Chicago. 1 ill., 1,200 words. *American City*, March. 35 cts.

**Water Storage.** Many towns and cities planning new installations and improvements in reservoirs, standpipes, etc.; the steel tank an advantage to small waterworks. 3 ills., 800 words. *Fire and Water Engineering*, Mar. 26. 15 cts.

**A War-Time Installation.** Use of cast iron pipe for a high pressure gravity system; laid in record time despite engineering difficulties of Tennessee mountain country. By C. W. Presdee. 4 ills., 1,400 words. *Fire and Water Engineering*, Mar. 26. 15 cts.

**Norfolk Water Department.** Report of the committee on fire prevention of the National Board of Fire Underwriters; improvements in the system. 1,200 words. *Fire and Water Engineering*, Mar. 26. 15 cts.

**How the City of Quincy, Ill., Purchased a \$1,000,000 Waterworks Plant with \$380,000.** By W. R. Geiston, supt. of waterworks, Quincy. 2,500 words. *Municipal and County Engineering*, March. 25 cts.

**New England Waterworks Association.** Final meeting of the season; two interesting and important papers read and discussed; large number of members and guests present; new members elected. 2,000 words. *Fire and Water Engineering*, Mar. 19. 15 cts.

**Distribution System.** The vital section of the waterworks; great activity in extensions and additions to come; developments in accessories. 2,000 words. *Fire and Water Engineering*, Mar. 26. 15 cts.

**Water Department Needs.** American municipalities appropriating huge sums for extensions and improvements to waterworks, filtration and purification while hundreds of smaller towns will install systems. 1,500 words. *Fire and Water Engineering*, Mar. 26. 15 cts.

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**Street Lighting in a City of Average Size.** Features of ornamental system at South Norwalk, Conn., with small initial cost and operated with a low maintenance expense; excellent illumination obtained with simple fixtures which assure safety. By C. D. Gray and E. Hagenlocher, of the J. C. White Engrg. Corporation. 6 ills., 2,000 words. *Electrical World*, Mar. 22. 15 cts.

**All-New Water-Gas Plant Results at Providence.** Portion of paper discussed by New England gas men at the recent Boston meeting with results of operation. By Wm. Russell, Providence, R. I. 4 ills., 2,100 words. *Gas Age*, Mar. 15. 15 cts.

### Hydro-Electric Power.

**A New Era in Power Transmission.** Development of water power, establishment of stations at mines and wider interconnections necessary for proper industrial development of the country and for social betterment of labor. By Dr. Louis Bell. 2,000 words. *Electrical World*, Mar. 29. 15 cts.

**State Aid for Water Power Development.** Suggestion for assuring fullest utilization of power resources; government should furnish capital and control rates; complete ownership by government not essential. By A. M. Beale, Water Power Branch, Department of Interior, Ottawa. 2,600 words. *Canadian Engineer*, Mar. 27. 15 cts.

**General Factors Affecting the Cost of Constructing Hydro Electric Development.** Special investigation of water power and storage matters in Maine conducted by the Public Utilities Commission. Extracts from the report upon the cost of development of water powers and electrical energy, by H. K. Barrows, consulting engr., Boston, Mass., who was employed by the commission. 3,500 words. *Engineering and Contracting*, Mar. 12. 15 cts.

**Electrical Generation and Distribution in Canada.** Comprehensive report by commission of conservation of Canada shows hydro electric power constitutes over 85% of total; extensive interconnected networks in provinces of Ontario and Quebec. 3 ills., 4,000 words. *Electrical Review*, Mar. 8. 30 cts.

**Colorado River Flood Control by Storage.** Reservoirs at available sites would so cut the flood at Yuma as to safeguard the Imperial valley; water-power and irrigation opportunities; a hundred more gaging stations needed. By E. C. La Rue, hydraulic engr., U. S. Geological Survey, Pasadena, Cal. 7 ills., 3,600 words. *Engineering News-Record*, Mar. 6. 20 cts.

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**Fire Equipment Statistics.** Apparatus now in use and in reserve in cities of the United States and Canada; remarkable amount of horse-drawn equipment still in service; figures on the progress of motorization; coming purchases of apparatus. 300 words, 7½ pages tables. *Firemen's Herald*, Mar. 1. 10 cts.

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**This Year's Needs of the Fire Service.** Several millions of dollars to be spent for new equipment and improvements in the departments; general move toward completed motorization and scientific fire-fighting methods. 1,600 words. *Fire and Water Engineering*, Mar. 26. 15 cts.

**The Arson Trust.** Incendiarism and the work of the "firebug" a serious problem for fire marshals and chiefs of departments; organized arson trust uncovered by good work of fire marshal's department of Michigan. By Homer Rutledge, ass's state fire marshal of

Mich. 1 ill., 1,200 words. *Fire and Water Engineering*, Mar. 19. 15 cts.

**Loss Information Service.** Important part insurance companies play in furnishing information to the fire marshal as to incendiaries; harm that timidity in showing up fraud can do in prosecution of the firebug. By State Fire Marshal L. T. Hussey, of Kansas. 1,000 words. *Fire and Water Engineering*, Mar. 12. 15 cts.

**Lessons of a Film Fire.** Pittsburgh explosion and fire in film exchange which caused heavy loss of life; the national board of fire underwriters draws conclusions and emphasizes lessons taught; new law suggested to regulate storage. 4 ills., 2,000 words. *Fire and Water Engineering*, Mar. 5. 15 cts.

**Alarm Systems and Accessories.** History shows progress toward certainty of operating and increasing development to meet modern requirements; the siren fire alarm popular; compressed air systems. 1,000 words. *Fire and Water Engineering*, Mar. 26. 15 cts.

**The Advantage of Police Patrol Signal Systems to Municipalities.** Contribute to increase the efficiency of police departments not less than 40 per cent. 1 ill., 1,200 words. *American City*, March. 35 cts.

## TRAFFIC AND TRANSPORTATION.

### Street Railways:

**Railway Right-of-Way Surveys and Descriptions.** Location chainage must be checked; description of curve; a line as a right-of-way. By E. T. Wilkie, formerly chief engr. Toronto Suburban Railway. 2,500 words. *Canadian Engineer*, Mar. 6. 15 cts.

**Six Hundred Safety Cars in 60 Cities.** New England Street Railway Club is told how use of safety car is still spreading rapidly; safety cars are revenue producers, expense cutters and good will gainers. 3,700 words. *Electric Railway Journal*, Mar. 8. 15 cts.

**How Can the Public Be Convinced?** Replies to questionnaire sent out by this journal that the public men express conviction that the public will respond to a frank and honest presentation of facts if good service is provided and the companies ask for a return on only a fair valuation. 5,500 words. *Electric Railway Journal*, Mar. 1. 15 cts.

**Ethical Aspects of the Situation.** Causes of fare trouble analyzed and remedies suggested; belief that the fallacy of a fixed fare has won widespread recognition and railways are "at the dawn of a better day." By R. T. Sullivan, gen. mgr. Mahoning & Shenango Railway & Light Co., Youngstown, O. 7,000 words. *Electric Railway Journal*, Mar. 1. 15 cts.

**Fifty-Fifty for Car Rider and Taxpayer.** Massachusetts commission recommends such plan to meet deficit of Bay State system from five-cent fare. 2,300 words. *Electric Railway Journal*, Mar. 1. 15 cts.

**The Zone Fare in Practice—Glasgow.** Extent of system; character of service and riding; fares. 7 ills., 6,500 words. By Walter Jackson. *Electric Railway Journal*, Mar. 8. 15 cts.

### Miscellaneous:

**What the Government Did in Inland Waterway Navigation.** Director-General of railroads reports on progress made during 1918 on waterways taken over by his administration. 1,800 words. *Engineering News-Record*, Mar. 6. 20 cts.

**Truck Transportation of Laborers and Materials.** Results and costs on work done by federal health authorities at Macon, Ga. By W. E. Hardenburg. 800 words. *Municipal Journal and Public Works*, Mar. 29. 10 cts.

## STREET CLEANING AND REFUSE DISPOSAL.

### Street Cleaning:

**Recommended Procedure in Cleaning Streets in Rochester, N. Y.** Brief constructive criticism of the common methods of street cleaning with special reference to conditions in Rochester. From summary of report submitted to mayor, by James W. Routh, chief engr. and John T. Child, ass't engr., Bureau of Municipal Research. 1,900 words. *Municipal and County Engineering*, March. 25 cts.

**Methods of Removing Snow from Highways.** How to prevent snow from drifting; portable and stationery snow fence; snow removed by road grader; A-shaped snow-plow; hand methods. 2,300 words. Engineering and Contracting, Mar. 5. 15 cts.

**Methods of Snow Removal from Highways.** Efficient methods outlined by state highway commissioner of Connecticut, Chas. J. Bennett in a report at the convention of the American Road Builders' Ass'n. 1,400 words. Engineering and Contracting, Mar. 5. 15 cts.

**A Study of Street Flushing.** Result of investigation of Rochester methods by Bureau of Municipal Research; machine flushing and hose flushing by contract and by city; recommendations concerning procedure; sprinkling methods. From report by John T. Child, under supervision of James W. Routh, ass't and chief engineers of the Bureau. 7 ills., 4,400 words. Municipal Journal, Mar. 8. 10 cts.

**Anaheim's Sprinkler Truck.** Equipment consists of a 2-ton Ford truck and can be used as truck with sprinkler an ordinary sprinkler wagon attached; can be used as truck with sprinkler detached. 1 ill., 400 words. Municipal Journal and Public Works, Mar. 29. 10 cts.

#### Refuse Disposal:

**Wrapping Garbage.** Practice still continued in Minneapolis and Trenton, two of the larger cities that adopted it some years ago. 400 words. Municipal Journal and Public Works, Mar. 29. 10 cts.

**A Garbage Crematory with Self-Respect.** That of Spokane, Wash., finished in white to compel cleanliness, and parking development of grounds carried out; showers and rest room for employees; systematic plans for storing materials. By Arthur E. Peterson, supt. of crematory division, department of public works, Spokane. 1 ill., 1,500 words. Municipal Journal, Mar. 15. 10 cts.

**Are Our Cities Clean?** Editorial comment on the filthy and unhealthy condition of the dumps, garbage disposal plants and other places where refuse is deposited in many of our cities. 700 words. Municipal Journal, Mar. 15. 10 cts.

**Municipal Waste Disposal by Cremation.** England shows greatest development in crematories; comparison of incinerators and destructors show that latter have many advantages over former. By James Elmo Smith, University of Illinois. 3,500 words. The Modern City, March. 40 cts.

**Indianapolis Garbage-Reduction Profits.** Nearly \$15,000 net profits reported from operation of the garbage-reduction works from May 26 to Dec. 31, 1918. 500 words. Engineering News-Record, Mar. 27. 20 cts.

**Creek Banks for Incinerator Refuse.** A letter from J. F. Byxbee, Jr., city engr. of Palo Alto, Cal., describing the use of incinerator refuse by that city. 500 words. Municipal Journal, Mar. 15.

**Garbage Disposal Costs and Contracts.** Editorial discussion of the relative costs to cities of different methods of disposal and length of contract period. 1,300 words. Municipal Journal, Mar. 22. 10 cts.

**Report on Methods of Garbage and Rubbish Collection and Disposal.** Results of recent investigation by a Pittsburgh municipal committee—Part 2. 1 ill., 1,200 words. American City, March. 35 cts.

**Transporting a City's Garbage.** Reduction plant in Cincinnati employs most up-to-date form of railway transportation for carrying waste from wagons to plant. By Felix J. Koch, 3 ills., 500 words. American City, March. 35 cts.

**Baltimore Adopts Feeding for Disposal of Garbage.** Former disposal methods; specifications covering reduction method; temporary disposal by burial; contract provisions. By W. E. Lee, water engr., Baltimore. 2,500 words. Municipal and County Engineering, March. 25 cts. 2,000 words. Engineering and Contracting, Mar. 12. 15 cts. 1 ill., 1,700 words. Municipal Journal, Mar. 22. 10 cts.

#### MATERIALS AND STRUCTURES.

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**Effect of Quantity of Mixing Water and Curing Conditions on the Strength and We. of Concrete.** Result of ex-

perimental studies by Prof. Duff A. Abrams of the Lewis Institute, Chicago. 9 ills., 3,600 words. Engineering and Contracting, Mar. 26. 15 cts.

**Blast Furnace Slag in Concrete and Reinforced Concrete.** Oxidation of sulphides in slags; practical suggestions for production of reinforced concrete. (Continued from Feb. 15.) By Dr. J. E. Stead, F.R.S. 3,200 words. Engineering World, Mar. 15. 15 cts.

**The Age of Concrete.** Uses to which this indispensable material is applied; making of cement revived and utilized only during the past half century to any extent. 5 ills., 2,300 words. The Modern City, March. 40 cts.

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**Artistic Bridge and Highway Railings.** American culture calls for more attractive structures; illustrations of attractive railings. 9 ills., 1,500 words. American City, March. 35 cts.

**Bridge Substructure Construction with Concrete Caissons Sunk by Open Excavation Method.** Design and construction of concrete caissons; methods of sinking caissons. 3 ills., 3,000 words. Engineering and Contracting, Mar. 26. 15 cts.

**Maintenance and Painting of Highway Bridges.** Every structure should be inspected at least once a year; estimating amount of paint required. By Chas. D. Snead, bridge engr., state department of public roads, Kentucky. 2,000 words. Engineering and Contracting, Mar. 26. 15 cts.

**Move Bridge Spans 136 Feet Endwise on Car Trucks.** Two lines of steel trucks on falsework carry hydraulic jacks which raise three spans together and support them while hauled by cables. 4 ills., 2,000 words. Engineering News-Record, Mar. 13. 20 cts.

**Reinforced Concrete Slab Bridge Design Based on Tests of Full Size Slabs.** Effective widths under central loads and values for effective widths. By A. T. Goldbeck, engr. of tests, U. S. Bureau of Public Roads. 2 ills., 3 tables, 1,500 words. Canadian Engineer, Mar. 6. 15 cts.

**Arch Analysis by a Method Using Variable Elastic Weights.** By simplifying the computation of the summations required, new tabular form permits rapid solution of arch problem by influence lines. By F. J. Delude, with J. C. White Engrg. Corporation, N. Y. 3 ills., 2 tables, 1,200 words. Engineering News-Record, Mar. 6. 20 cts.

**Canadian Reinforced Concrete Arch Bridges.** Historical review and lists of open spandrel and earth-filled arches with clear span of over 100 ft. or total bridge length of over 200 ft.; brief review of concrete truss bridges. By Frank Barber, consulting engr., Toronto. 6 ills., 3,300 words. Canadian Engineer, Mar. 13. 15 cts.

#### MISCELLANEOUS.

**Efficient Methods of Financing Highway Bond Issues.** Problem has many factors determined by local conditions; license fees work well in states lacking good roads. 1,300 words. Engineering News-Record, Mar. 20. 20 cts.

**Municipal Revenue and Real Estate Taxes.** Giving letter from the director of the Bureau of Industrial Research of Indianapolis, Ray S. Trent, referring to the article on "Increasing Municipal Revenue" which appeared in our issue for Feb. 15. 800 words. Municipal Journal, Mar. 8. 10 cts.

**Pennsylvania Has Emergency Public Works Commission.** Body provided for two years ago to tide over expected periods of depression is now stimulating construction. 1,000 words. Engineering News-Record, Mar. 13. 20 cts.

**Grand Haven's Municipal Utilities.** Financial statement of Grand Haven, Mich., sent by city manager, I. R. Ellison, warrants the pride he takes in them. 300 words. Municipal Journal and Public Works, Mar. 29. 10 cts.

**New Engine Terminal Outside City Avoids Congestion.** Crowded site replaced in open country; water stored and treated; standard designs employed; engines coaled on three tracks. 6 ills., 1,700 words. Engineering News-Record, Mar. 13. 20 cts.

**Inclined Viaduct for Pedestrians.** Brief description and illustration of viaduct built to avoid climbing steps up bank. 1 ill., 100 words. Municipal Journal and Public Works, Mar. 29. 10 cts.

**San Francisco's Protected Beach.** Description of esplanade which has proved to be a satisfactory method of protecting beach. 8 ills., 1,200 words. Engineering World, Mar. 1. 15 cts.

**Municipal Markets a Check to High Prices.** Bill passed by the New Jersey Legislature in 1917 with a view to protect public from the extortion of food profiteers; farmers' markets popular in several New Jersey cities; the municipal market at Long Beach, Cal. 3 ills., 2,400 words. The Modern City, March. 40 cts.

**Cost of Camp Utility Operation by the Construction Division of Our Army.** Roads, buildings, fire protection, electric service, heating, water-supply, sewerage and sewage treatment with grease recovery, refrigeration and railroad service. By Geo. W. Fuller, consulting engr., N. Y. C. 1 ill., 3,100 words. Engineering News-Record, Mar. 27. 20 cts.

**Central Station Heating: Its Economic Features with Reference to Community Service.** Extracts from an interesting discussion of possible economies that may be effected through the wider use of central heating, by John C. White in Technical Paper 191, issued by the U. S. Dept. of Interior. 3,200 words. Engineering and Contracting, Mar. 12. 15 cts.

**Some Conditions Observed in Public Utility Plants by a Representative of the U. S. Fuel Administration.** Means of reducing expenses; interconnection of power and utility plants; steam pumping sometimes most economical. By Chas. Brossman, consulting engr., Merchants Bank bldg., Indianapolis, Ind. 2 ills., 1,700 words. Municipal and County Engineering, March. 25 cts.

**Waste Paper Reports.** Annual report of a water board containing 70 pages, two pages of which would suffice to print all the information concerning year's operation that it is desirable to include. 400 words. Municipal Journal and Public Works, Mar. 29. 10 cts.

**Accurate and Compact Record of City Property.** New Castle, Pa., has system of maps and forms covering entire city to record property titles and transfers. 1 ill., 1,000 words. Engineering News-Record, Mar. 20. 20 cts.

**Centralized Buying for Municipalities.** Resolution adopted by the National Association of Purchasing Agents at recent meeting. 200 words. Municipal Journal, Mar. 22. 10 cts.

**Day Labor Does Municipal Work at Flint, Mich.** Engineer favors direct employment for cities of moderate size and contract system for small and large cities. 600 words. Engineering News-Record, Mar. 13. 20 cts.

**The Construction Prospect.** U. S. Department of Labor reports projected work totaling in value about \$1,709,000,000. 150 words. Municipal Journal and Public Works, Mar. 29. 10 cts.

**Will Prices Fall?** Editorial discussion of the national question of the day; not likely to fall in the near future; business men should adjust themselves to a permanently higher price level in order to save the nation from misfortune resulting from unemployment. 1,400 words. Engineering News-Record, Mar. 20. 20 cts.

**Governors' and Mayors' Reconstruction Conference Fails to Get Action.** Officials at meeting in Washington do more listening than talking and adopt prepared resolutions, but recommend no comprehensive program. 2,000 words. Engineering News-Record, Mar. 13. 20 cts.

**Practicing Engineers Suggest Lines of Progress in Engineering Education.** Communications from practicing engineers indicating directions in which engineering colleges should progress. Articles by John D. Isaacs, consulting engr., Southern Pacific Co., N. Y.; A. P. Davis, director, U. S. Reclamation Service, Washington, D. C.; Virgil G. Marant, War Service Committee on Gypsum, Washington, D. C.; M. M. O'Shaughnessy, city engr., San Francisco; John S. Crandell, N. Y. C.; F. L. Bishop, dean, School of Engrg., University of Pittsburgh; J. A. L. Waddell, consulting engr., Kansas City, Mo. 4,800 words. Engineering News-Record, Mar. 6. 20 cts.

**How the Cornell Society of Civil Engineers Find the Right Job for the Right Man.** Description of system developed by registration bureau of the society, abstracted from article by C. S. Rindfuss. 1,000 words. Engineering and Contracting, Mar. 19. 15 cts.





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# Liquid **E B G** Chlorine

## Quality and Service PLUS

"\*We wish to express our satisfaction with the quality of gas which we have had this past year, and also for the service rendered. Under great shipping difficulties we have been able to get our supply regularly and with one exception always had a small reserve. This means a great deal to us in water sterilization."

From the day E. B. G. Liquid Chlorine was first put upon the market, 12 years ago, its quality has been vigorously maintained at the highest possible standard.

The greatest care is taken in every department of its manufacture to assure a product of unvarying reliability—a gas entirely free from any foreign impurities—100% pure—100% efficient.

"E. B. G." Service has been developed to match the high quality of E. B. G. Liquid Chlorine.

We invite your inquiries

### **ELECTRO BLEACHING GAS COMPANY**

Pioneers and Leading Manufacturers of Liquid Chlorine

PLANT: NIAGARA FALLS, N. Y.

Main Office: 18 East Forty-First Street, New York City

CHICAGO OFFICE:  
11 South La Salle Street

Canadian Representatives:  
General Supply Company of Canada, Ltd.  
Ottawa Toronto Montreal Winnipeg  
Vancouver

*\*Paragraph from letter recently received at our New York Office.*